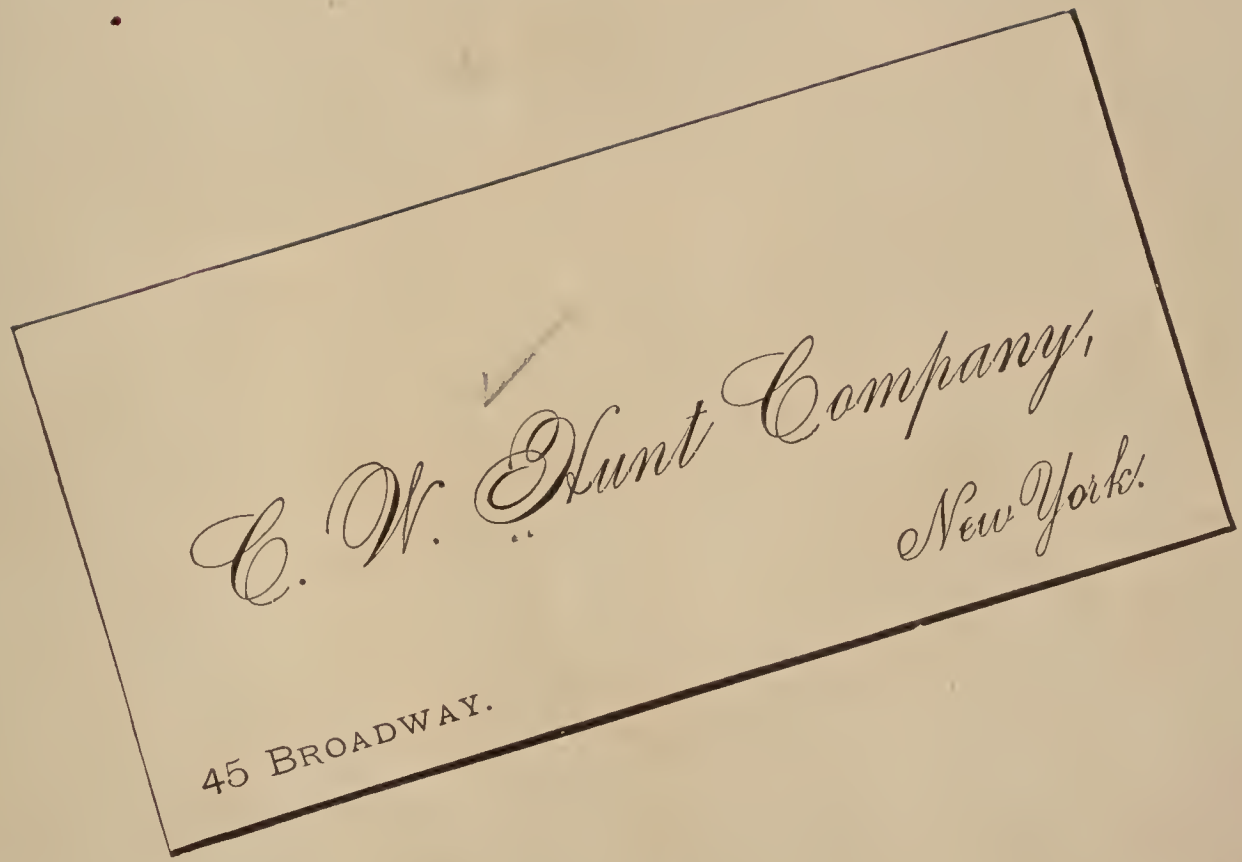


COAL AND ORE HANDLING MACHINERY.

COAL AND ORE HANDLING MACHINERY.

A BRIEF HISTORY

Of the Development of Machinery for Unloading and Storing Cargoes of

COAL AND ORE.

No. 89.
By Main Force and Stupidity.

THE EVOLUTION OF
COAL HANDLING MACHINERY.

No. 94.

THE tendency of machinery for unloading vessels and for handling coal, iron ore and similar materials, has been towards more rapid work, and at a less expense per ton, necessarily requiring machinery that is heavier, more complex, and more expensive. The change from doing the work almost entirely by hand, to the present method of doing the work wholly by machinery, has been a gradual one. The first method required a great amount of hard physical labor. The present method requires but little exertion on the part of workmen, but requires more skill, entails greater responsibility, and a higher rate of wages per day.

It will give a clearer idea of the changes in the method of handling, to follow the gradual improvements that have been made.

No. 136.—Unloading Vessels in the West India Ports.

The primitive method of unloading coal from vessels was for the workmen to carry it ashore in baskets on their heads. This method is still in general use in the ports of India, Africa, the West Indies and South America. From 50 to 150 men and women work together, and take out from three to four tons per day to each person employed. The wages paid are only a few cents per day, and the laborers are at about the lowest point in the scale of civilization.

An improvement on this method is the one now in general use at New Orleans, and other lower Mississippi ports. The coal is shoveled directly into the wheelbarrows, and wheeled ashore on temporary plank runs. Eighteen wheelers, with a water carrier and an axe man, make a gang; there being two gangs to each boat, making a total of about forty men. Each man takes out on an average about six tons of coal per day.

No. 118. — Unloading Coal at New Orleans.

No. 111. — Coal Handling in Cincinnati, Ohio.

At Cincinnati, Louisville and St. Louis the coal is shoveled into cars instead of wheelbarrows, which is an improvement upon the lower Mississippi methods, but yet is very laborious and expensive.

Another improvement was made by erecting a mast and gaff, using half-barrels as tubs

and hoisting the coal with a horse, and dumping it into a cart, or into wheelbarrows on an elevated run. This saved wheeling the coal up hill or throwing it a great distance into cars. With this method there were employed two shovelers, one man to lead the horse, and from four to six men for dumping and wheeling, making a total of seven to nine men employed.

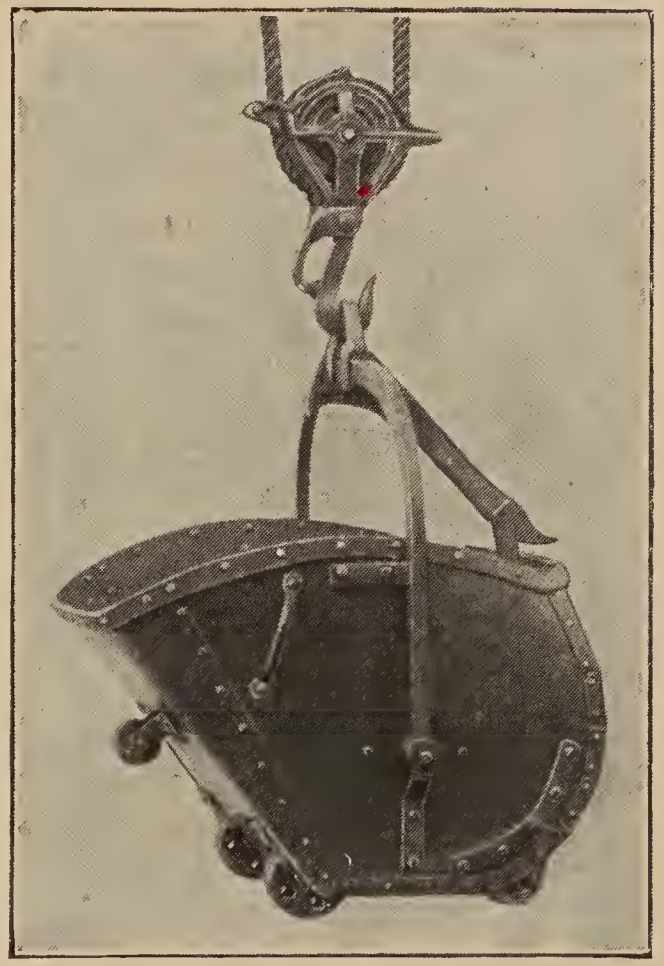
No. 126. — Mast and Gaff for Coal Hoisting in New York.

No. 1117. — Wheeling Coal.

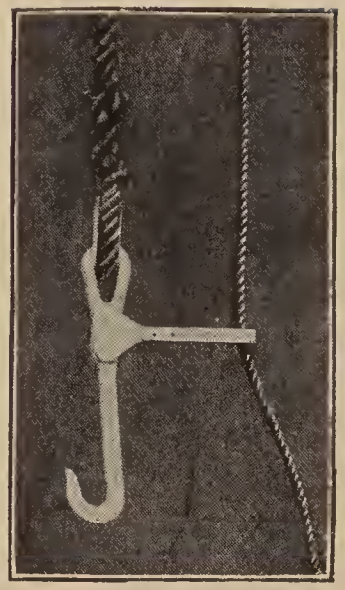
The daily output was about ten tons per day for each man employed. It will be noticed that the workman on the cart has reached the point in civilization of wearing a Derby hat.

Another improvement was made in 1857 by Mr. George Focht, whose business integrity and firmness of character made him widely known among users of this kind of machinery. Instead of the round wooden tub, he devised a peculiarly shaped

No. 1023.— Rear view of Coal Tub.



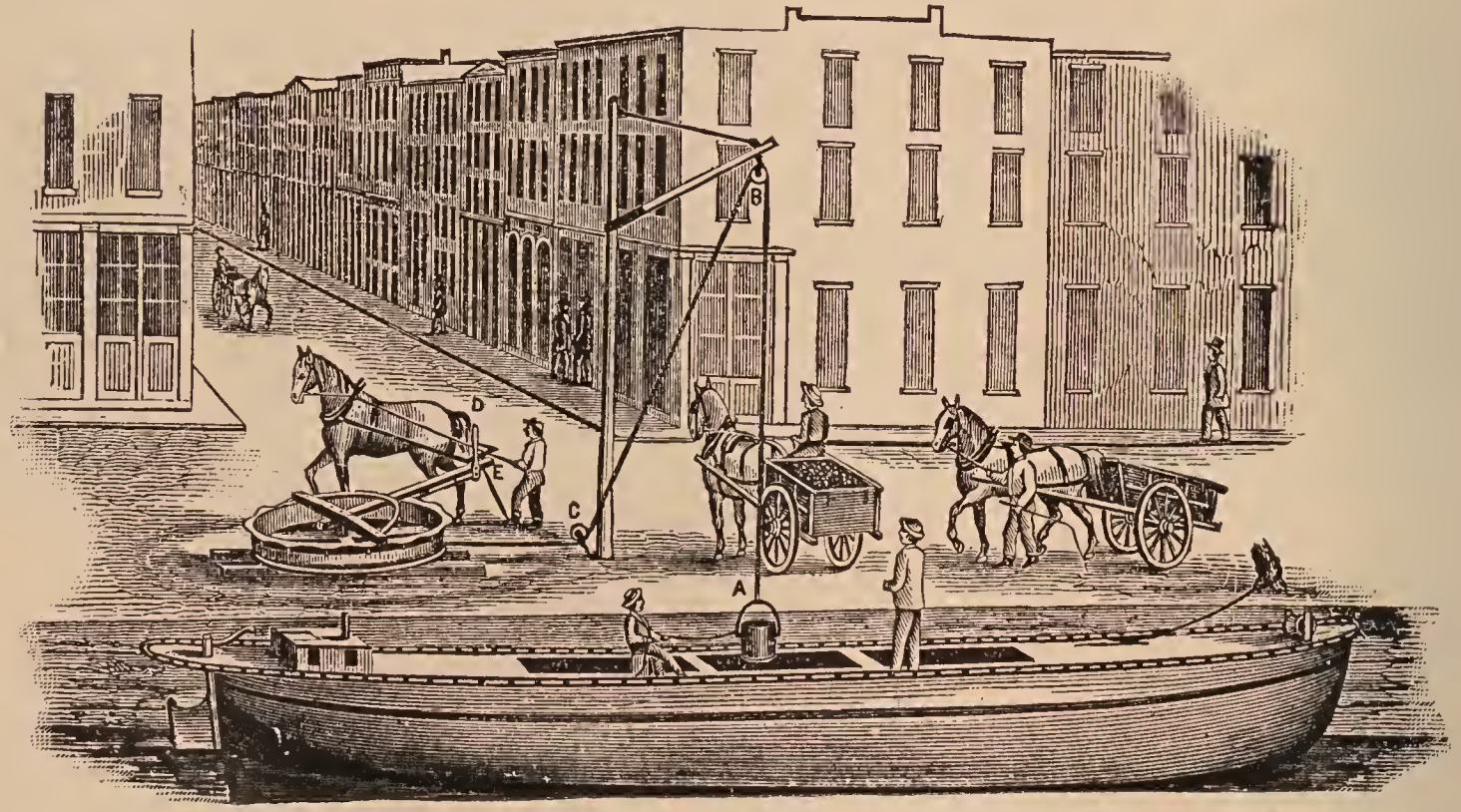
No. 1146.— Modern Coal Tub.



No. 1136.— Tub Hook for single whip hoisting.

and balanced iron tub, which is now in almost universal use. This tub is top heavy when filled, and bottom heavy when empty, consequently it is self-dumping and self-righting. It is also formed so that it is much easier to fill than a round tub. This did not reduce the number of men, but increased their efficiency, and made the daily output about twelve tons for each man employed.

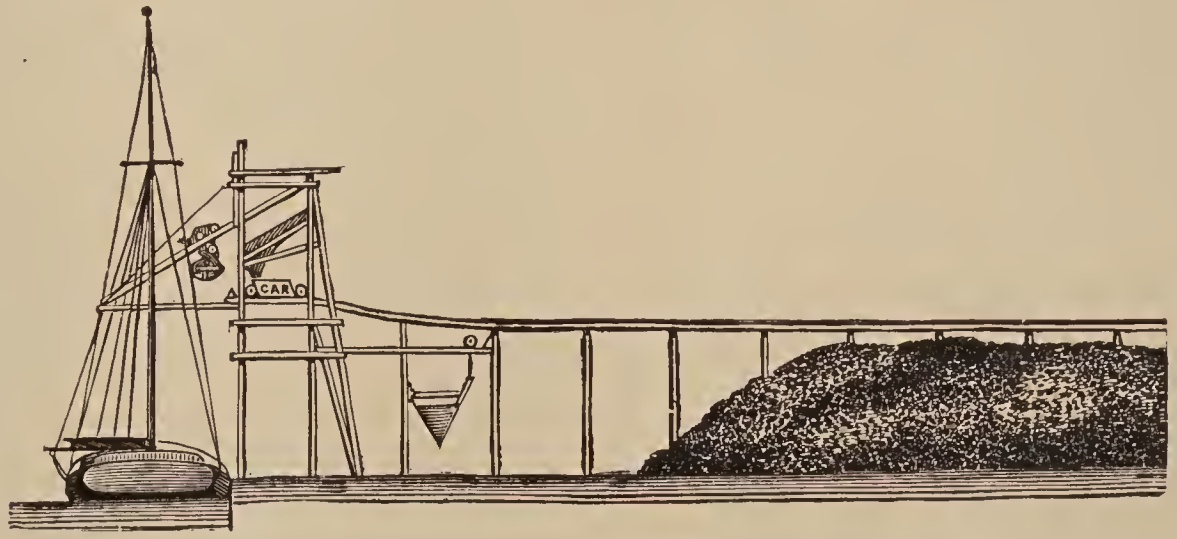
An improvement made by Mr. P. K. Dederick, of Albany, N. Y., was a horse-hoisting machine that very materially reduced the labor of the horse in hoisting. Previous to this, the horse walked forward to hoist a full bucket, and was obliged to back to lower the empty bucket into the hold of the vessel. With most horses, this latter was harder work than hoisting the loaded bucket, while the Dederick machine increased the speed of unloading but little, it reduced the labor of the horse about one-half.



No. 1163.— Hoisting Coal from Canal Boats with Dederick Machines.

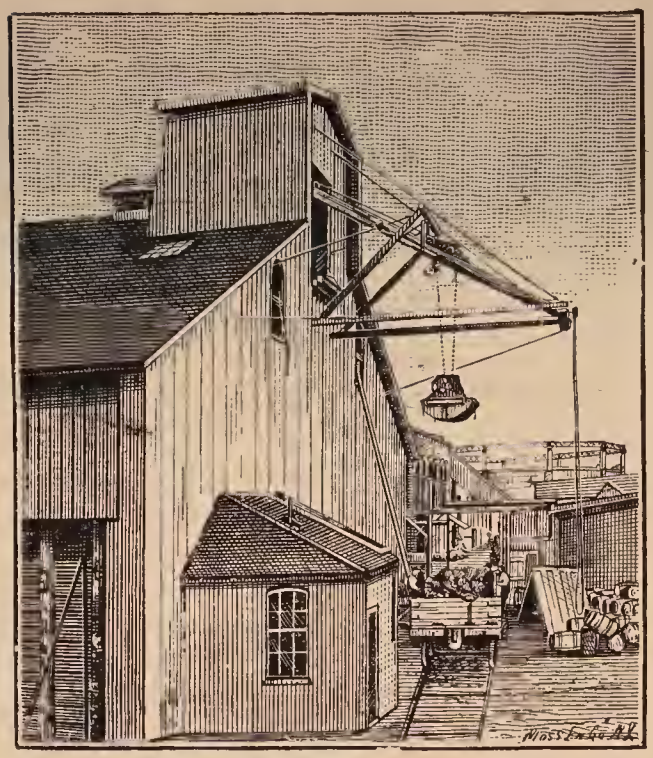
The next decided step in advance was the introduction of The Hunt Automatic Railway. This Railway is operated entirely by gravity, needing neither steam, horse nor manual power. The car runs down the track, dumps its load and returns to the loading place automatically.

The workman does not accompany the car, and has ample time while the car is making the trip to weigh the coal and enter it in his weight-book. With one man only, the coal can be weighed and stored in any desired bin within 500 or 600 feet of the vessel. As the carrying capacity of this car is over sixty tons per hour, the number of shovelers in the hold of the vessel was increased to three, and the coal was hoisted by a small steam engine. The output now was about fifteen tons per hour, or 150 tons per day, with a total of five men employed: three shovelers, one hoister and one attending the automatic car, or an average of about twenty-five to thirty tons per day for each man employed.

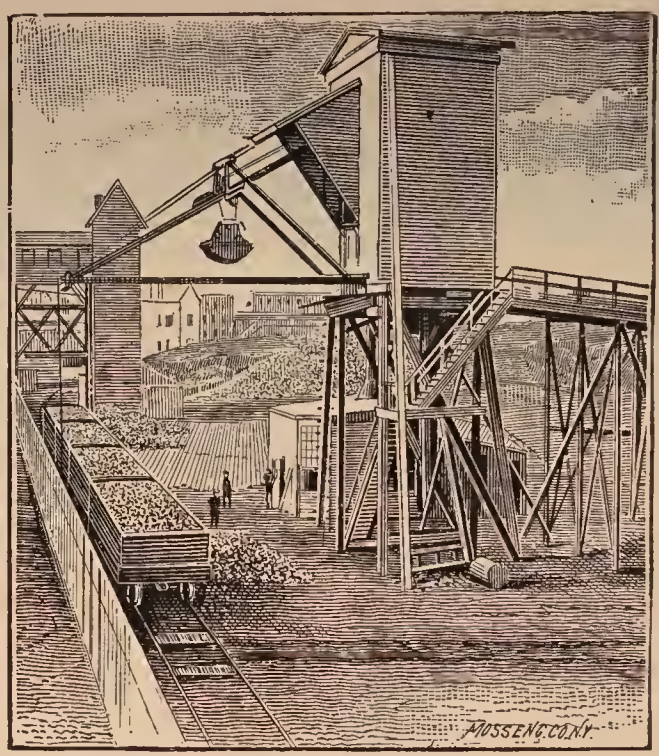


No. 2.—Coal Storage Plant, Elevator and Automatic Railway.

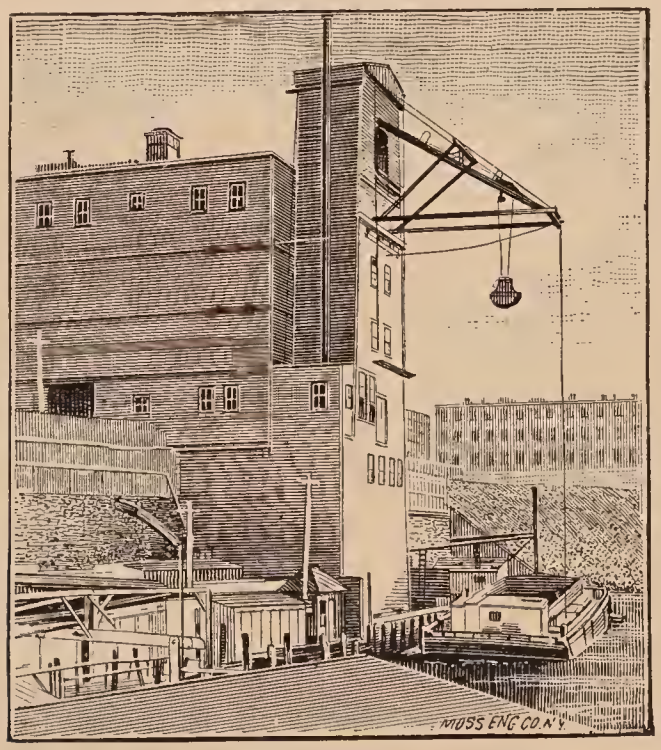
The increase in the speed of handling by the use of the steam engine and the automatic car, made the swinging of the bucket, as it came out of the hold, whether using an ordinary gaff or hoisting from a sling from the mast head, very objectionable. This was overcome by the use of the "Hunt Elevator," which had inclined booms running out over the vessel, the bucket being hoisted vertically until it reached the booms, and then guided by a track up the booms



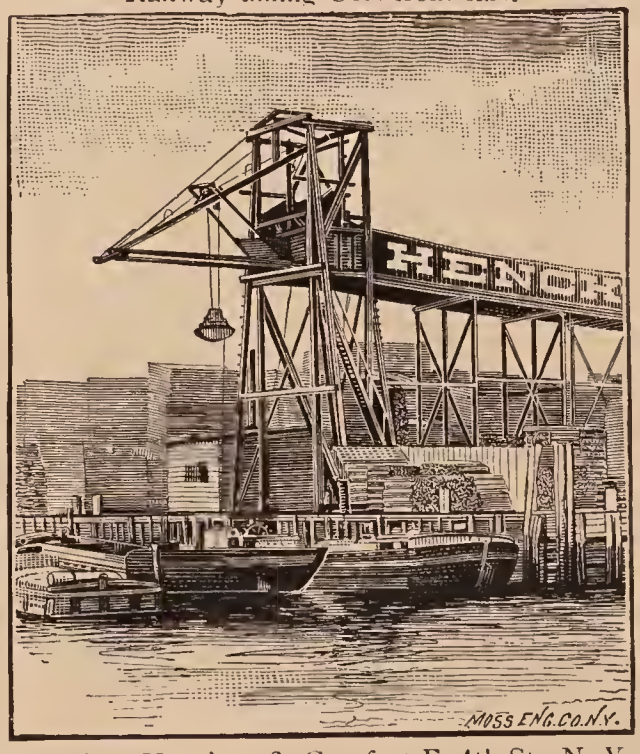
No. 84.—Toronto Gas Light Co. Steam Shovel Elevator and Automatic Railway, taking Coal from cars.



No. 87.—Union Elevated Railway, Brooklyn, N.Y. Steam Shovel Elevator and Automatic Railway taking Coal from cars.



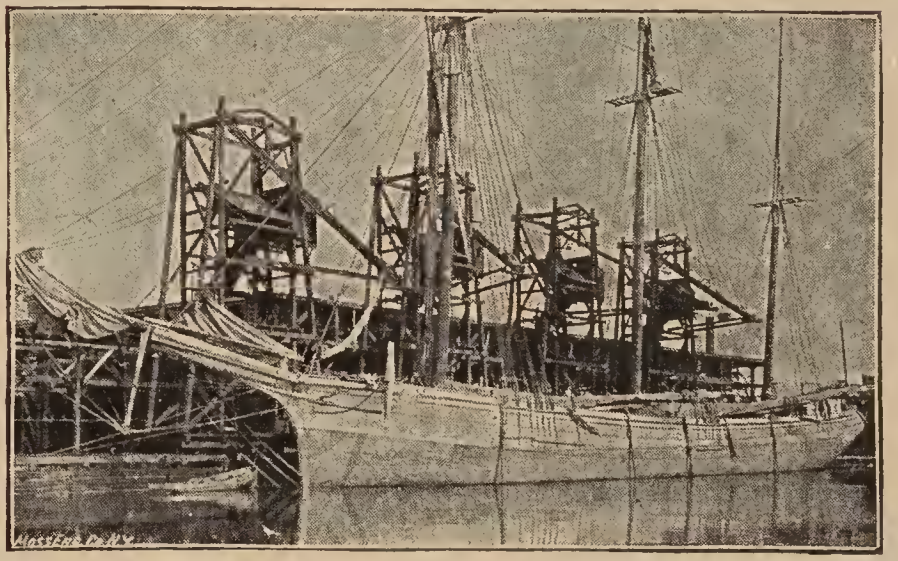
No. 85.—Curtis & Blaisdell, New York City. Steam Shovel, Elevator, Automatic Railways and Coal Pockets. Automatic Car 90 ft. above the wharf.



No. 86.—Hencken & Co., foot E. 4th St., N. Y. Steam Shovel Elevator, Automatic Railway and Coal Pockets.

to the dumping place. The buckets moved exactly in the same path each trip. This permitted the engine to hoist at a greater speed, and also the use of larger buckets, which were gradually increased until it was customary to use buckets holding from half a ton to one ton, depending on the class of vessels being unloaded. The number of shovelers was

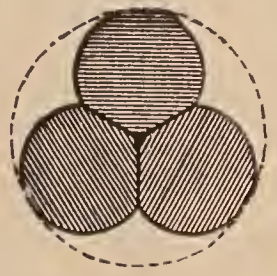
No. 122 —H. L. Herbert & Co. Coal Yard, foot 29th St., E. R., N.Y.
Steam Shovel Elevator, Automatic Railways and Coal Pockets.



No. 106.—Pennsylvania Coal Co., Milwaukee, Wis.
Four Movable Elevators.

increased from four to six men. The output per day with this machine was about thirty-five or forty tons per day for each man employed. This increase of weight in the buckets, and the increase in speed, caused a rapid wear of the hoisting rope. Attempts to use wire rope were generally unsuccessful, principally because the workmen would

frequently hook on a bucket that was standing ten or fifteen feet from the hatch. The engine would in this case draw the wire rope around the sharp corner of the hatch coamings; this would injure the rope, and it was this injury, instead of the legitimate wear that was most troublesome and destructive. Manila hoisting rope of the best quality could not always be procured; the users purchasing from ship chandlers, who usually only keep ordinary commercial



Cross Section of Three Strand Rope.

No. 1057

Cross Section of Four Strand Rope.

No. 1058

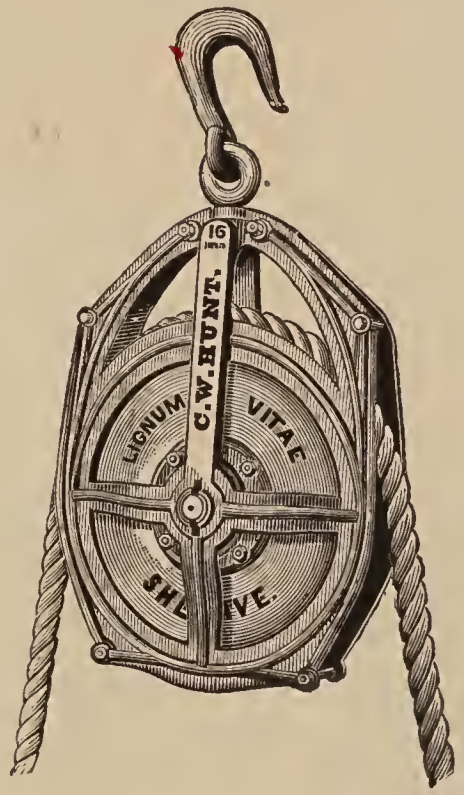
No. 1028.—Hunt's Patent Four Strand Manila Hoisting Rope.

rope. We made a careful investigation of the causes of the wear or rope, an abstract of which will be found in our detailed description of ropes of our manufacture. We then had manufactured, under our patent, a rope of the very finest quality of manila, laid up with the purest plumbago, and with sufficient tallow to hold it in position. The plumbago, obviated the internal wear, and the durability of the rope was increased two or three times that of ordinary rope used for hoisting purposes.

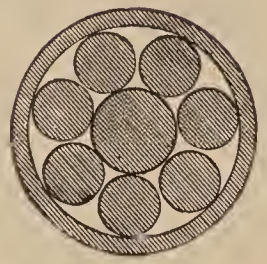
The sheaves over which the rope ran, having a heavier load, and running more rapidly,

caused trouble, and we then made the improvements in the bearings of these sheaves, which are found described in detail elsewhere.

No. 1052.— Hunt's Ball or universal joint for dock blocks.



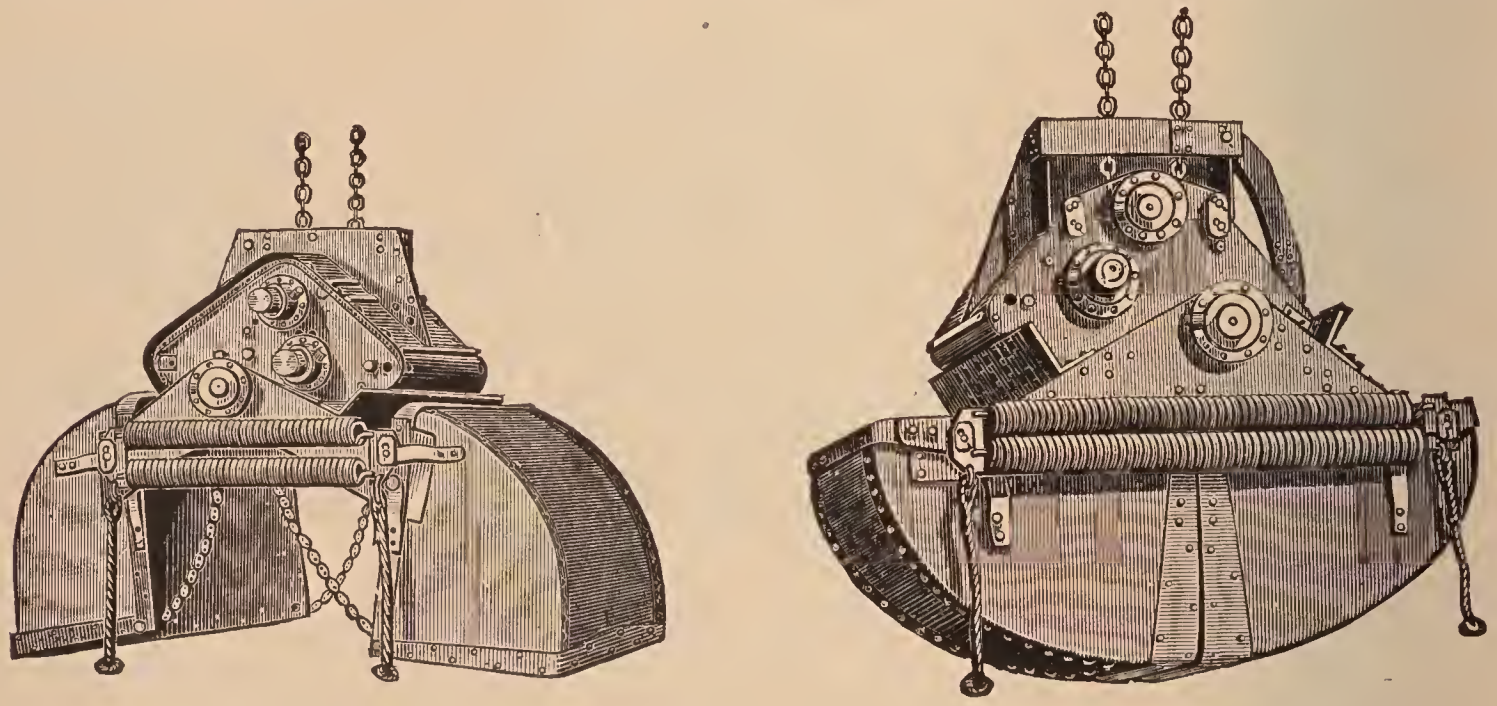
No. 1015. — Hunt's Hoisting Blocks for manila rope.



No. 91. — Hunt's patent roller bearing.

Shoveling coal is not only very hard work, but requires considerable skill. Owing to the intermittent character of the work, the wages paid are far above the ordinary price, for other labor and in most of the large coal handling centres "Coal Shovelers' Unions" were formed that arbitrarily fixed the price for shoveling coal, which varies for the shoveling alone from eight to sixteen cents per ton at different ports. The wages received at these prices were from $4 to $8 per day for each workman.

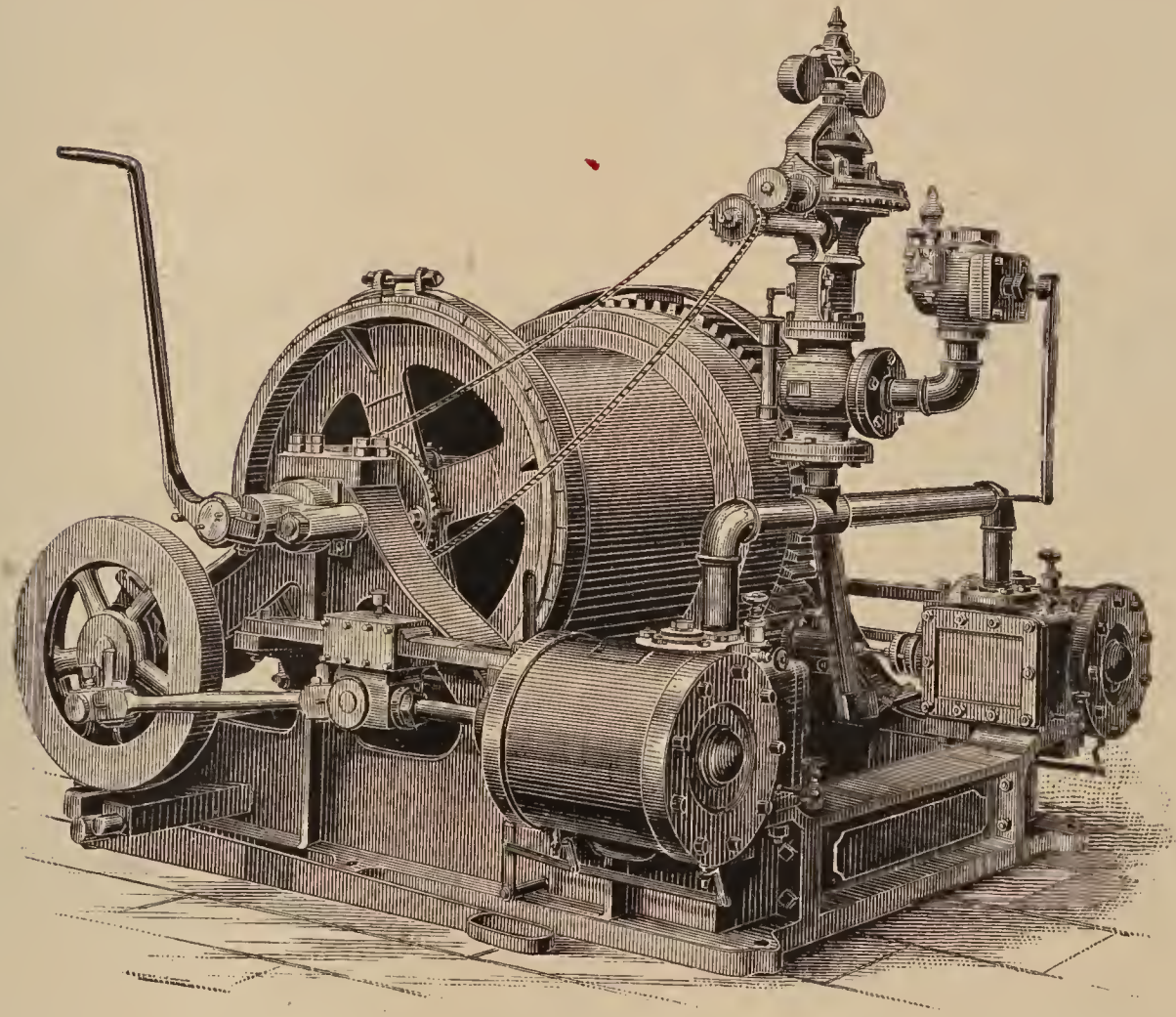
To reduce this expense, and at the same time to increase the daily output, we devised our Steam Shovel, which fills itself when lowered on the coal, and carries from one to one and a half tons to a load. It is entirely automatic both in filling and in dumping, so that no one is required on the vessel in any way, except towards the last to scrape the coal out of the corners. It picks up the coal as clean as it can be done by



19 20.

Hunt's Steam Shovel for Coal Handling.

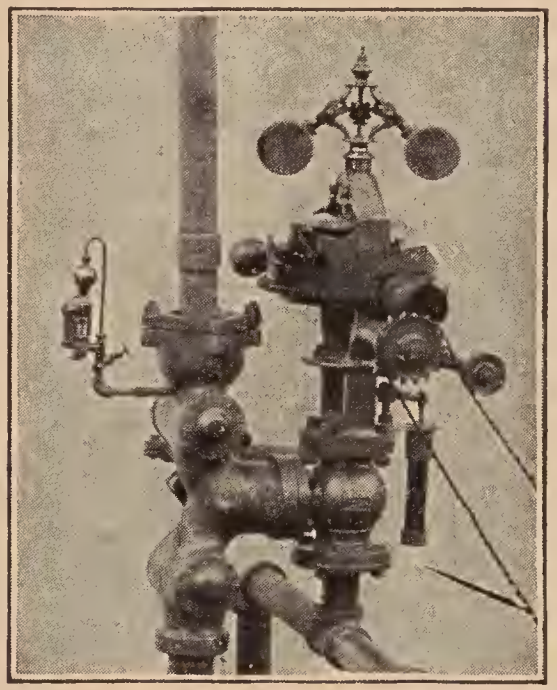
a man shoveling, does not injure the ceiling of the vessel in the least, and breaks the coal far less than hand shoveling. Usually one man is put on the vessel to attend the lines, and move the vessel to position from time to time as the coal is taken out, and towards the last to gather up the scattered coal. As this shovel and its load weigh about six thousand pounds, a very great increase in the size of the engine was necessary.



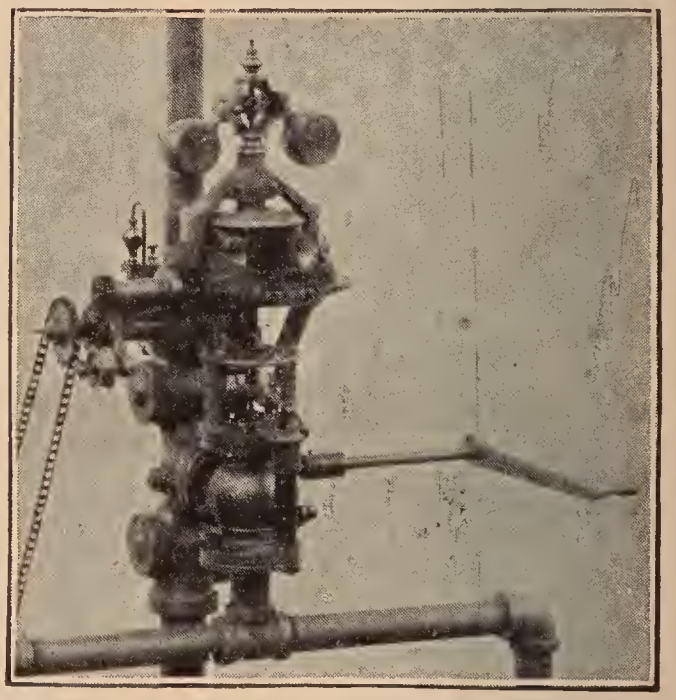
No. 1127.— Hunt's Rapid Hoisting Engine—75-horse power, with variable governor for steam shovel.

With these powerful engines it required considerable skill on the part of the engineer to handle the throttle in hoisting. It was necessary for the bucket to be started slowly from the hold of the vessel, the engine running at a moderate speed until it cleared the coaming of the hatches, then hoisted at the highest speed until it approached the projecting booms

of the elevator, where it was then slowed up to a moderate speed, then run fast up the booms and stopped at the dumping point. To do this with rapidity and certainty at all times requires an amount of skill that it is sometimes difficult to obtain. To obviate this we have attached to our engines a governor arranged in a very peculiar manner. The governor is driven from



1133.

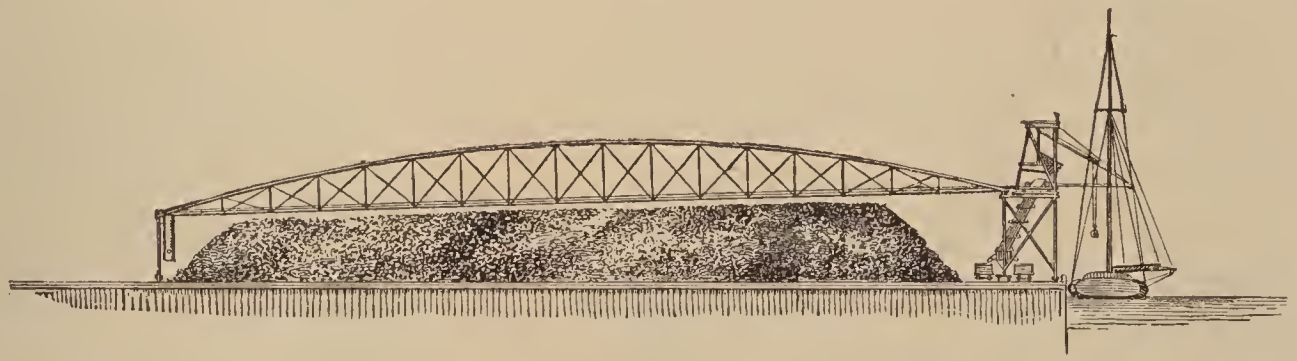


1135.

Hunt's Governor for automatically changing the speed of the engine.

the drum upon which the chain winds, and not from the shaft of the engine, and is arranged in such a manner that the speed can be automatically varied so as to make the different changes of speed entirely independent of the throttle valve, or the engineer. The engineer in hoisting throws the throttle valve wide open, the governor regulating the speed of the engine, fast or slow, at the different points, and with unerring certainty.

This shovel carries over a ton of coal at each trip, and will make a round trip in about forty-five seconds, which makes a theoretical amount of one hundred tons hoisted per hour, but the average speed of unloading in discharging cargoes is from fifty to seventy tons per hour at each hatch, with one man on the vessel, one at the engine to hoist and one to attend the automatic car, making a total of three men who take out from five hundred to seven hundred tons per day, or from one hundred and sixty to two hundred and thirty tons per day for each man employed at the work; thus the efficiency of one man's work has been increased, by the use of modern machinery, from three to over two hun-



No. 128 —Automatic machinery with bridge 300 feet span especially adapted to iron ore handling. The Elevator and bridge are movable along the entire length of the wharf.

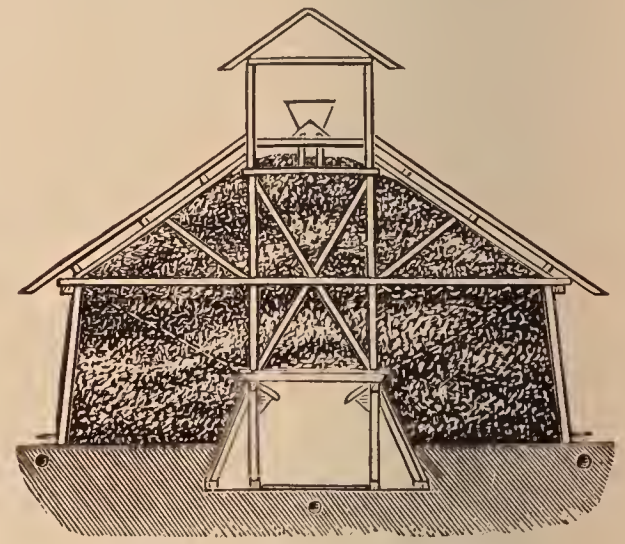
dred tons per day of ten hours, or in the proportion of about seventy to one, and the increase since 1873, when our Mr. Hunt began the introduction of our automatic machinery, has been about TWENTY TO ONE, and at the same time the physical exertion of the laborer is much less severe, and the wages paid to the workmen per day nearly fifty per cent. greater.

Notwithstanding this increase in the price paid to the workmen, the whole labor expense of taking coal out of a vessel, hoisting it from thirty to ninety feet, weighing it and running it back from two hundred to three hundred feet and storing it in elevated bins or pockets ready to draw

into carts, in no case exceeds three cents per ton, and has been reduced in some cases to one and one-tenth cent per ton in regular work.

Formerly, the coal was piled on the ground and exposed to the weather; As the business increased coal sheds were built to protect it from snow and rain. The enormous expansion of the trade required some of these buildings to be very large, and the loss of

No. 113.—3000 ton Coal Pocket with Hunt's Automatic Machinery.



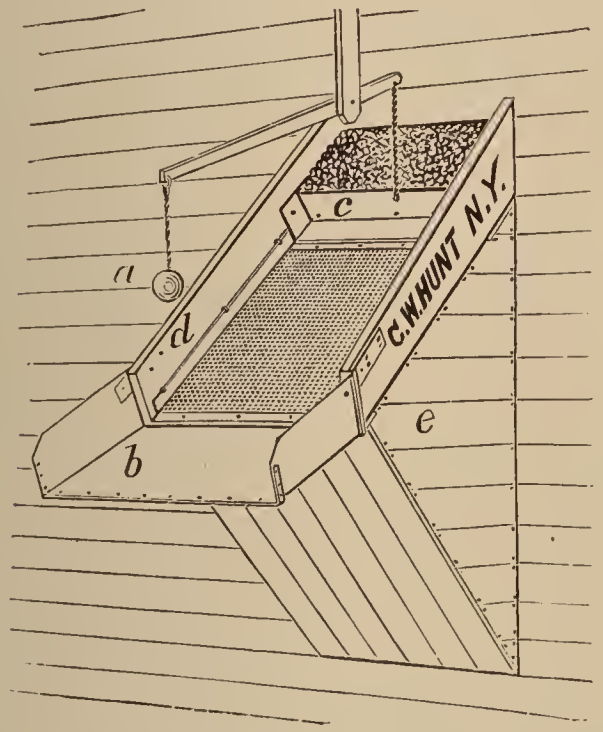
No. 79.—Coal Building, with Hunt's Patent Tunnel.

time in loading teams, and the great delay while waiting for each other, where a large number were employed, led to the erection of what are usually called "coal pockets," or buildings for holding coal, that are elevated one story, the teams driving beneath the floor on which the coal rests and loading the coal into carts or wagons by drawing it through chutes.

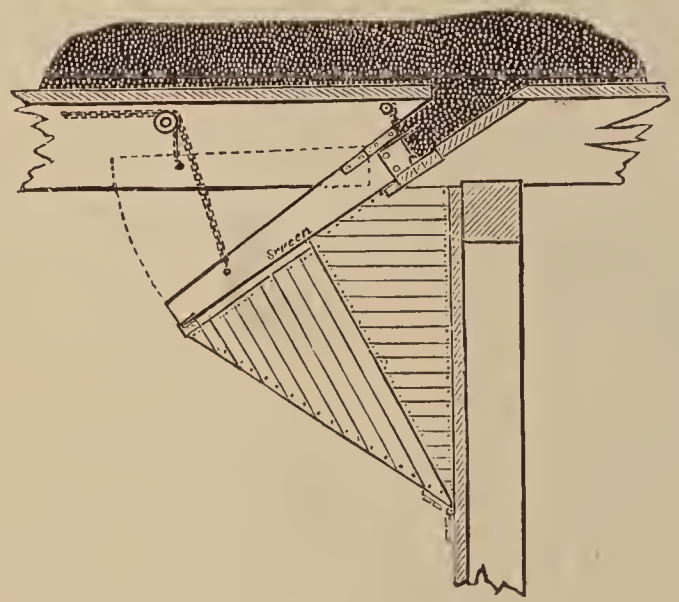
The very great strength required in these buildings that must sustain many thousand tons, led to the construction of buildings requiring an especial engineering training and

experience. In the engravings will be found many examples, for the most of which we made the general and detailed drawings.

As it is necessary to screen anthracite coal, a somewhat peculiar valve and screen is used, especially adapted for use in these pockets. This permits coal to be loaded into the wagons, and screened very much more carefully than it is practical to do by hand.



1006.

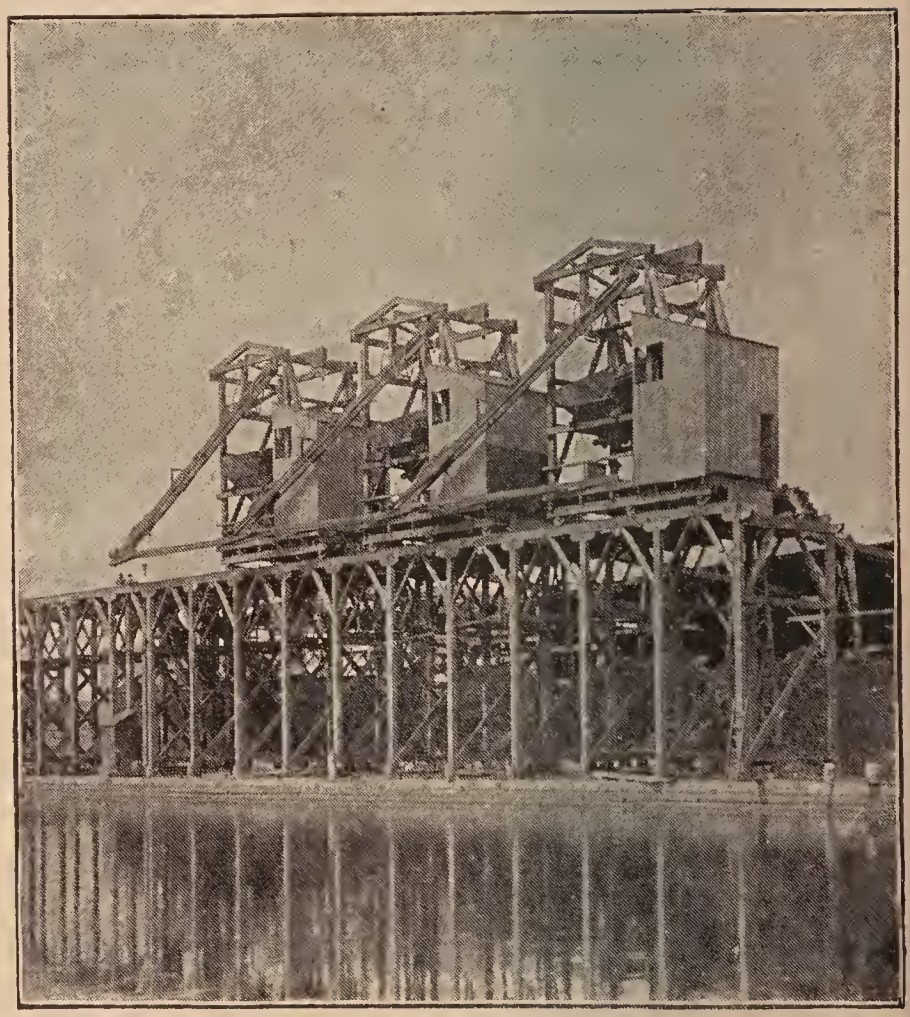


1007.

Coal Chute with Briggs Valve and removable Screen.

Of the great number of valves and chutes devised for Anthracite Coal, that invented by Mr. J. N. Briggs, of Albany, is the simplest and most efficient. It has the great advantage that a large piece of coal will go through it as easily as a small piece, and it can never get obstructed. For convenience they are made with removable screens of various sizes so that

No. 99.—New York Gas Light Co. Two Elevators and Automatic Railways.



No. 100.—R. P. Elmore & Co., Milwaukee. Three Movable Elevators and Automatic Railways.

the coal can be thoroughly screened, and run into the cart without hand labor, the screenings being run into a separate bin.

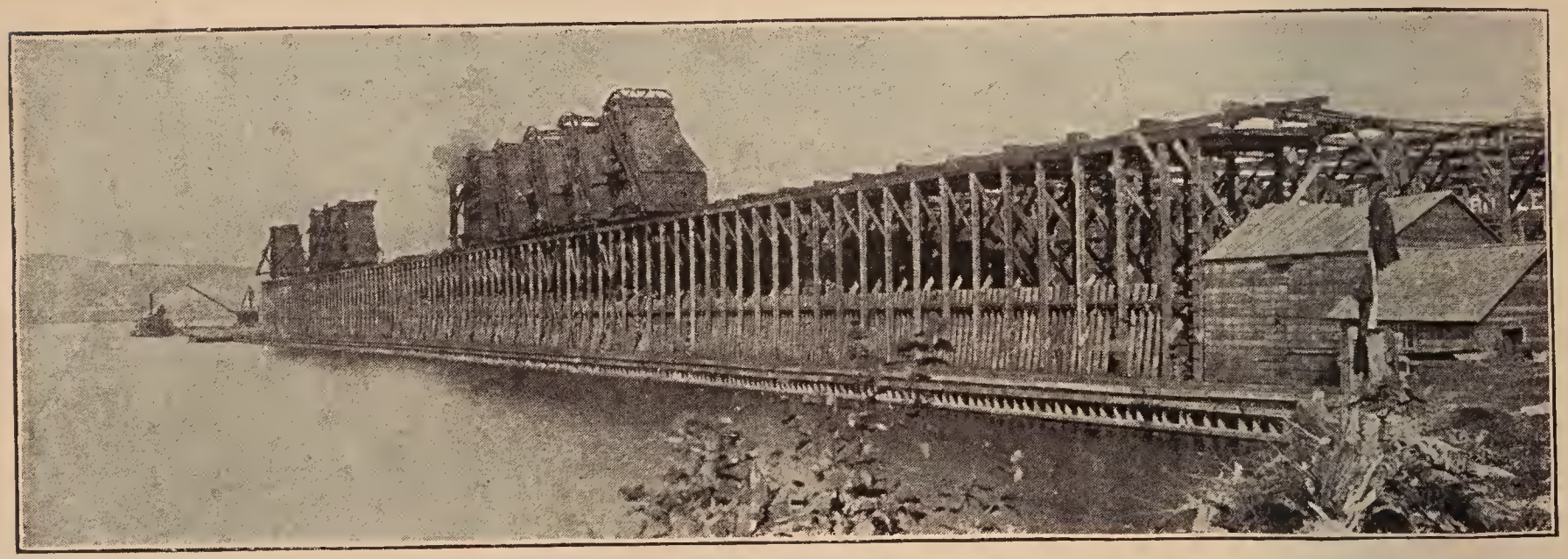
It will be seen that a complete apparatus for coal handling is a very expensive affair, but this large expense is justified by the great speed and the low cost per ton at which the coal can be handled. The expense of unloading a ton of coal from a vessel in most of our

No. 95.—Milwaukee Gas Light Co., Coal wharf. 3 Elevators, movable on top of the building.

seaports has been, by the usual method employed by stevedores, twenty-five cents per ton for shoveling and hoisting, about three cents per ton for wheeling, to which must be added a charge for the expense of screening and loading into carts, making a total expense of from thirty to forty cents per ton, and in many parts of the country a higher price is paid.

The same work of taking from a vessel, hoisting, weighing and running back and storing in coal pockets ready to draw by gravity into carts, in many yards using our machinery,

does not exceed *three cents per ton*, only one-thirteenth the cost of the previous method of working. The difference in the expense of handling coal for one year by the two methods, after making an allowance for fuel, oil and for interest and depreciation on the plant would be a large sum. This great saving will justify a large expenditure for machinery, and



No. 96.—Lehigh Coal & Iron Co., West Superior, Wis. Fitted with Hunt Machinery, * wharf 2000 ft. long 300 ft. wide. Nine Elevators and 75 Automatic Railways—Capacity for unloading from vessels, 7000 tons per day.

any false economy in the size, capacity or perfection of the machinery will be the poorest kind of business judgment.

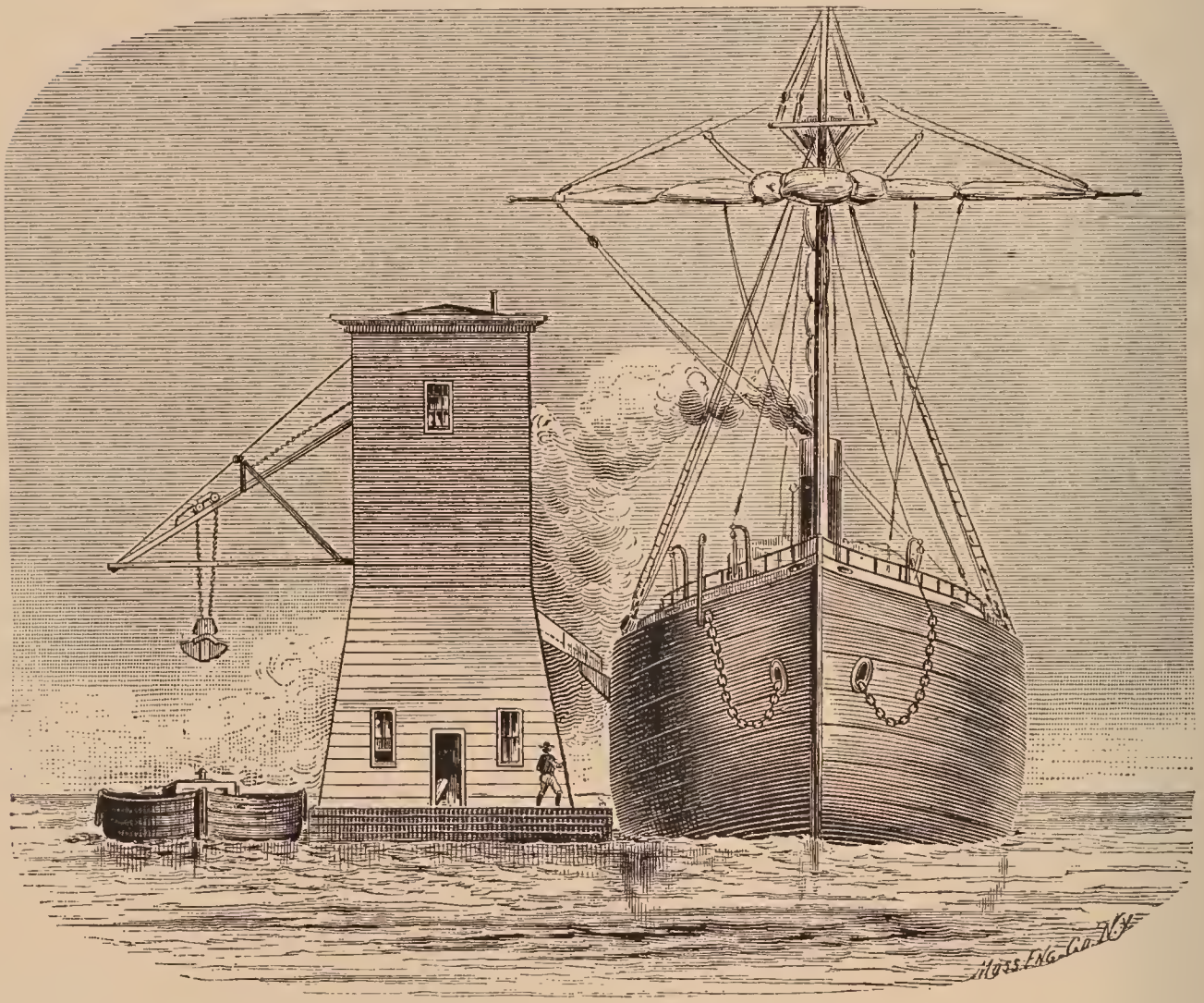
The time has passed when a coal dealer can in any of our cities permanently do business on a small capital, or with cheap fixtures. Harsh as it may seem, it is

* When docks have a long water front, the Elevators are set on wheels running on a track along the water front, or on the side and top of the building. The engine is placed in the Elevator, and the whole affair moved to any part of the wharf required. In this way only as many Elevators are built as may be needed to unload at the requisite speed ; yet a very long dock can be fully utilized

unquestionably true that such a one must sooner or later retire from the business and leave the field to those who are thoroughly equipped to work rapidly and cheaply.

THE FOLLOWING TABLE SHOWS THE COMPARATIVE COST OF COAL HANDLING IN VARIOUS PORTS, AND THE SAVING THAT IS MADE BY THOSE USEING THE MOST IMPROVED MACHINERY.

1889.	New York.	Boston.	Milwaukee and Lake Ports.
Regular price charged by stevedores for shoveling and hoisting one ton of coal from the vessels.....	15 cts.	25 cts.	35 cts.
Wheeling to bin, average distance.....	2 cts.	2 cts.	4 cts.
Screening from the stock pile and loading into carts or wagons.....	6 cts.	7 cts.	6 cts.
Allowance for loss of time of the team while waiting to be loaded by hand labor.....	10 cts.	12 cts.	10 cts.
Total cost of handling the coal from the hold of the vessel to the delivery wagon.....	33 cts.	46 cts.	55 cts.
The cost shown by experience, of doing the same work by our AUTOMATIC MACHINERY, such as shown in engravings Nos. 83, 84, 85, 86, 87, 94, 95, 96, 99, 100, 101, 103, 105, 106, 110, 113, 116, and 122, would not exceed on the most suitable vessel.....	2 cts.	3 cts.	3 cts.
The cost on such vessels as can now be chartered without trouble.....	$2\frac{1}{2}$ cts.	4 cts.	6 cts.
Difference between stevedore charges and the cost with AUTOMATIC MACHINERY.....	from $30\frac{1}{2}$ cts. to 31 cts.	from 42 cts. to 43 cts.	from 49 cts. to 52 cts.



No. 83.—Hunt's Automatic Machinery adapted to Coaling Steamships.

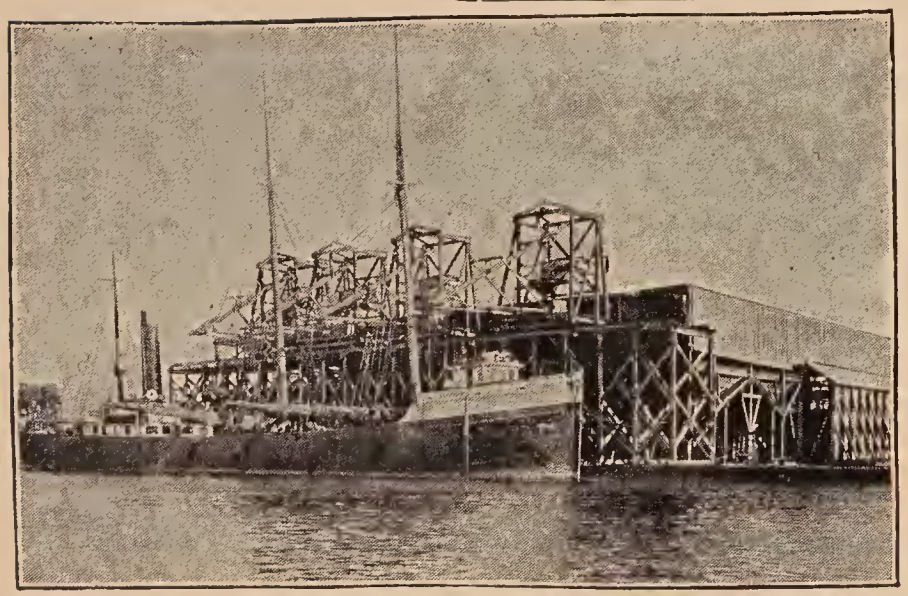
A dealer handling forty thousand tons of coal per annum by using the Hunt machinery would save at New York prices $12,000, at Boston prices $17,000 and at lake port prices $20,000 a year.

Omitting all the advantages which this machinery gives in the rapid discharging of vessels, the saving in wharf room to do the same business, the less number of horses, wagons and stable room to be provided, the freedom from strikes of laborers, and the more perfect screening of coal sent out, the annual saving to a dealer handling forty thousand tons would justify an expenditure for machinery and storage pockets : New York, $80,000, Boston, $123,000, lake ports $133,000, estimated on the basis of six per cent. interest for the money, and a deduction of ten per cent. for wear and tear, which will permit a total renewal of every part of the investment every ten years.

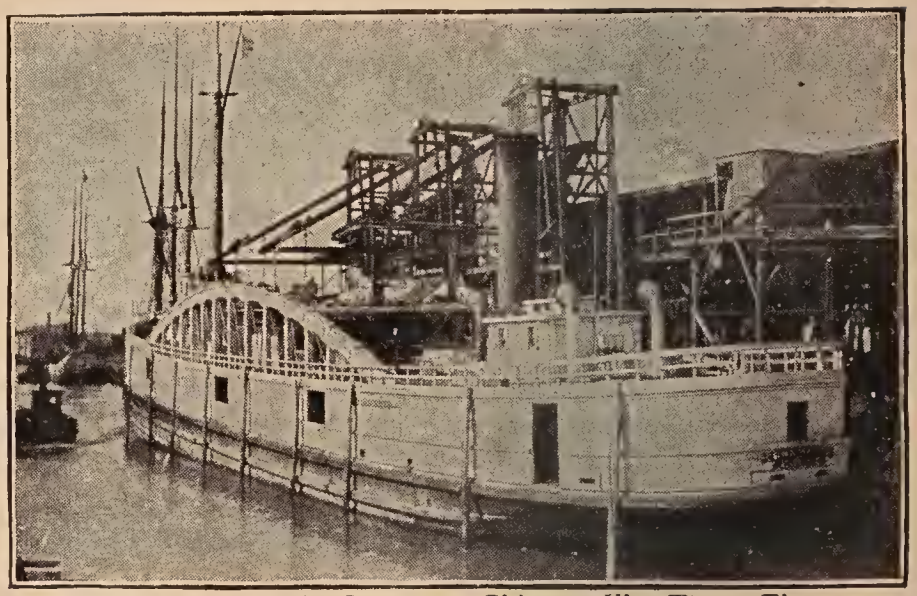
The different parts of this machinery are described elsewhere, together with many modifications it is advisable to make in peculiar situations to suit the different materials, and the amount of work to be done. A small yard handling but two or three thousand tons per year would not be justified in making so large an expenditure as the most perfect machinery would entail. In such cases they can use parts of it that will make the greatest saving for a justifiable expenditure.

As the efficiency of this class of machinery depends not only upon the best design, but also upon the perfection of the workmanship, so that there will not be expensive and vexatious delays, we build all of the machinery at our own shops under the strictest supervision, both as to material and workmanship.

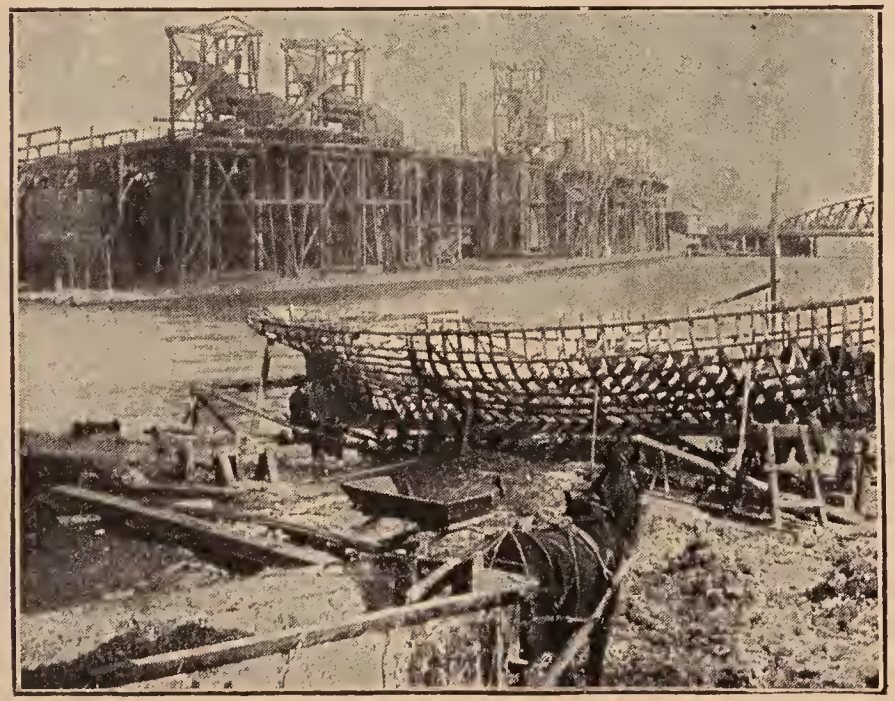
The laws of nature are inexorable, and no amount of enthusiasm in the maker, rhetoric in description, or fancy paint and polish, will make poorly designed and poorly built machinery satisfactory when put to the test of regular work. We, like other business men, elect what class of customers to deal with. We seek that class of purchasers who wish machinery thor-



No. 116.—E. L. Hedstrom & Co., South Chicago, Ill. Four Elevators, Automatic Railways and Coal Pockets.



No. 110.— Pennsylvania Coal Co., Chicago Ill. Three Elevators and Automatic Railways.



No. 101.—Robert Law, Chicago, Ill. Six Elevators and Automatic Railways. The roof of this coal shed covers five acres.

No. 103.—Brooklyn Sugar Refining Co., Brooklyn, N. Y. Elevator, Automatic Railway and Coal Pocket. The Automatic Car is 80 ft. above wharf.

oughly well built, and which has every part carefully made from the best materials, and who are willing to pay whatever amount may be necessary to obtain such an article. For this reason we give no anxious thought as to whether this or that can be made a little cheaper, but have the materials and workmanship just as thoroughly good as possible. The sole criterion being whether the article will be better adapted for its work or more durable in use. We do not, and will not, make any machinery that is not as good in every respect as though the purchaser himself had selected the materials, and personally supervised the construction.

Our customers are entirely those who use and wear out the articles they purchase, consequently quality takes precedence of cost with them. Having no trade with middle men, and paying no commissions, there is no temptation to reduce the quality of articles to compete with those who seek that class of business.

It is a common idea that because coal is heavy and dusty, coal machinery is rough and coarse. This is a wholly mistaken belief; no Waltham watch or Baldwin locomotive is more carefully designed, the details more thoroughly studied, or the materials more carefully selected and worked into shape than are the working parts of the Hunt Shovel, Elevator and Automatic Railway. At first sight it may seem to be a useless refinement to work to templets and turn shafts to vary less than one-thousandth part of an inch, make taper fits and other refinements of modern machanism on machinery to be roughly handled, covered with grease and dust and exposed to every storm, but it is a positive economy, as the increased durability and freedom from delays justify this painstaking care and expense.

Possibly some readers may have the idea that the improvements made in this class of machinery have first been a happy thought put into the form of a drawing or model, and that then the inventor has sought, in some class of business, a customer who would adopt the device and put it into use. The various kinds of machinery built by the C. W. Hunt Company have had a widely different origin. Every improvement has been devised to meet a definite want of a customer, and not invented first and a place to use it found afterwards. This wholly eliminates experimental machinery; a real want is met, instead of an inventor's idea of what somebody ought to want.

MODERN COAL HANDLING MACHINERY.

H. G. Jordon & Co., Coal Yard, Boston, Mass. Steam Shovels, Movable Elevators, Variable Automatic Hoisting Engines, Automatic Railways, Coal Pockets, and Screens.

WHAT MACHINERY SHALL I USE?

No. 128.

Coal is distributed throughout the Eastern part of the United States by being carried by rail from the mines to the various shipping ports, and from thence carried to the point of consumption, in every part of the sea coast reached by water, in vessels varying in size from 60 to 3,500 tons. There is also a large distribution of coal from Buffalo, Cleveland, Ashtabula, and the various lower lake ports by water to Chicago, Milwaukee, Gladstone, Ashland, Superior, Duluth, and other points in the northwest. The remainder of the coal is delivered directly from the mines to the consumer by rail. The very large amount distributed by water carriage makes it necessary to use machinery for taking the coal from the vessels and delivering it to the carts ready to distribute to the consumers. This difference in the method of transportation divides this kind of coal handling machinery into two kinds, which are entirely distinct from each other in mechanical construction: one for unloading coal from vessels, the other taking the coal from the cars, each one delivering either directly into carts, or storing it in bins or pockets, and then delivering to carts or locomotives. The first class of machinery, viz., that taking the coal from the vessels alongside, hoisting, placing in bins and

delivering to carts, is more or less complex and expensive, according to the amount of business to be done. Where the business is very large, the most complete and expensive rapid-working machinery is used. Where the amount is small, a large expenditure for the most perfect-working plant would not be justified by the saving in expense of handling. The expense and the perfection of the machinery that should be used can only be decided by taking into consideration all of the conditions of a particular location, such as the amount to be handled per annum, the greatest amount to be handled per day, the size and the class of the vessels, the location of the yard, the regularity or irregularity in the receipt or the distribution of the coal, the wages of men per day, the difficulty of obtaining suitable labor, and the liabilities of strikes. Each of these has its effect in making a definite decision. While it is impossible to accurately decide what machinery should be used, without a full knowledge of all of these points, yet the general experience of coal dealers and stevedores, handling this class of materials, is an approximate guide to the machinery that should be adopted. Taking a general survey of this class of business, and drawing our conclusions from the actual practice of men most interested in doing the work with the greatest economy, we find that—

It is usual for dealers handling 500 tons of coal per annum, or less, to use a mast and gaff, similar to that shown in cuts Nos. 1080, 126, with steel coal tubs, holding about 1-6 to 1-5 of a ton, similar to cut No. 1022, using a horse for hoisting and dumping into carts. Where the coal is to be put on the wharf, the gaff is swung around and the bucket is dumped on the pile of coal on the wharf.

When the volume of business runs from 500 to 1,000 tons per annum, it is usual to make the mast higher and to erect an elevated trestle or track, and using on this either wheel-barrows, such as shown in cut No. 1117, or a car, such as cut No. 1139.

When the business exceeds 1,000 tons per annum and running up to 2,000, the Automatic Railway (cut No. 2), elsewhere described, is usually used, instead of the wheel-barrows. In particular locations, especially for use in unfavorably-placed buildings, the cars are moved by hand, instead of running automatically as the Automatic Railway. In handling this amount of coal it is very common to use a small steam engine for hoisting, instead of horses, especially if the coal comes in cargoes of 200 tons, or over.

In a business of from 2,000 to 5,000 tons per annum, the most suitable machinery is the coal hoisting elevator and Automatic Railway, such as shown in cut No. 2, a steam-hoisting engine and steel self-dumping coal buckets, holding a half ton of coal each. With this magnitude of business it is advisable to have a coal pocket of a greater or less capacity, which is a building holding the coal and ten or twelve feet above the level of the ground, the teams driving under and drawing the coal from the bins through chutes directly into the carts. These coal pockets require to be of great strength and especially constructed for the purpose, and fitted with chutes with suitable valves and screens for convenience in use and for the delivery of clean coal.

Exceeding 5,000 tons per annum the same machinery is needed, with the exception that instead of coal tubs to be filled by hand, the steam shovel should be used, if the class of vessels in which the coal is received is suitable for its use. If the vessels are such that the steam shovel cannot be used, then the ordinary steel self-dumping buckets are to be used, holding 1-2 to 3-4 ton each, the coal being shoveled by hand. A plant of this character is capable of doing an annual business of from 30,000 to 40,000 tons, if the coal can be received during the whole season in the usual manner. The working capacity per day of ten hours would average about 200 to 350 tons, if using the ordinary buckets filled by hand, and from 500 to 600 tons per day with the use of the steam shovel.

For storing iron ore and other minerals in quantity, a modification in storage tracks

is made, as it is desirable to have no posts in ore piles. In this case the Automatic Track is carried on a light iron bridge 200 to 350 feet span. The support at each end is on wheels, so that the whole affair, with the elevator, Automatic Railway and hoisting engines move bodily along the wharf, making a pile of any length. See cut No. 128.

Where the cargoes to be received are large and the despatch of the vessel important, duplicate sets of machinery are frequently used, working two hatches at the same time on the same vessel. In the lake ports, where a steamer carrying coal tows two consorts, machinery must in this case be extensive enough to unload three vessels at one time, as one vessel cannot leave until the others are unloaded. The Lehigh Coal & Iron Co., at West Superior, Wis. (cut No. 96), have nine elevators, which will work three hatches in each of three vessels, and when there are two vessels, they can work four hatches in one, and five in the other. Machinery nearly as extensive is in use at Gladstone, Mich., and at E. L. Hedstrom's dock, South Chicago (cut No. 116), and many others. The necessity for this large amount of expensive machinery is to save the time of the vessels. In all of the lake ports it is customary to work at two or more hatches of a vessel at the same time, as vessel owners will not charter unless the consignee will agree to unload from at least two hatches at the same time.

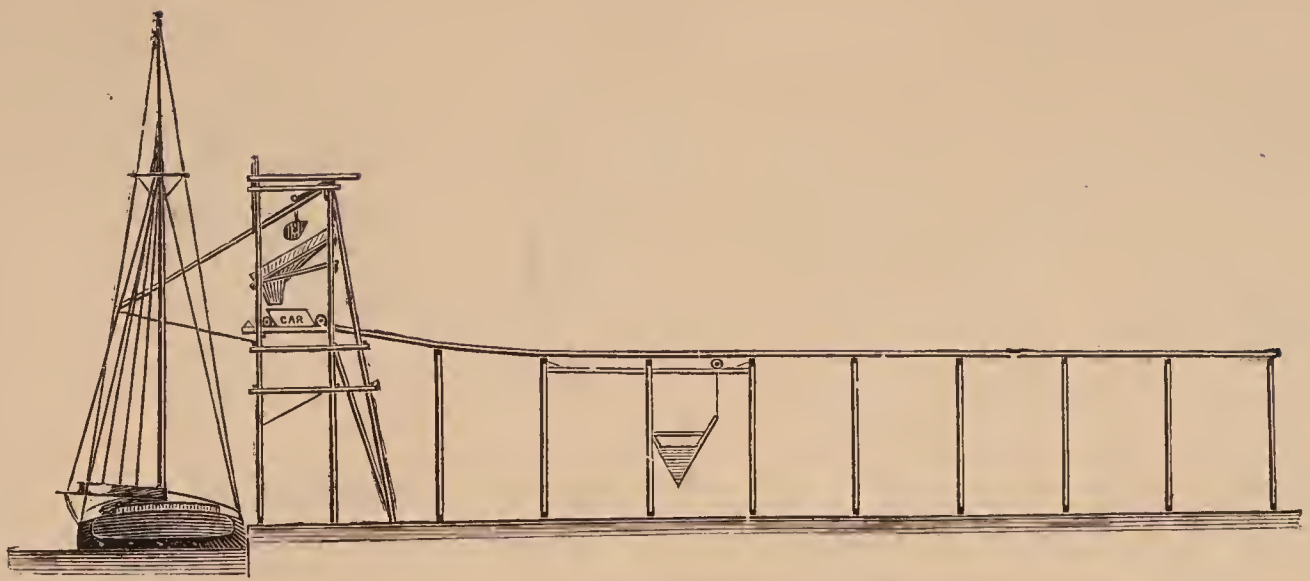
In this catalogue the different parts of the machinery needed for handling coal are described separately, as they perform different parts of the work, and more or less of these different machines are combined according to the situation and the work to be done.

Possibly the reader may not get a perfect idea of the operation of our machinery from the detail descriptions given elsewhere, although we have attempted to make them as simple as possible. There is only one way to get a clear and true idea of it, and that is to see it actually at work. An hour spent in seeing the general operation and examining the details, will do more to give you a correct idea of it than all the descriptions and photographs that we can publish.

Since 1873, we have been building this class of machinery, and the theory that we have constantly had in view is, first, that it is not advisable as a business to build machinery for temporary work, but only for places where it would be used in a regular methodical business when durability and economical working would please the purchaser, and also advertise it to others, and next, that we would build everything in design, materials and workmanship, just as carefully as though the purchaser was personally present to inspect every part, and that for such design, materials and work, we would charge a just and reasonable price. No matter what a customer might say, or think that he wanted, we knew that if he wanted the machinery to use in a regular business, he really wanted the materials good, and built with careful workmanship ; and we have persistently refused to build lighter or cheaper machinery, believing that such work would only be working ourselves out of business, as the tendency of modern machinery is to do work faster and at less expense per ton.

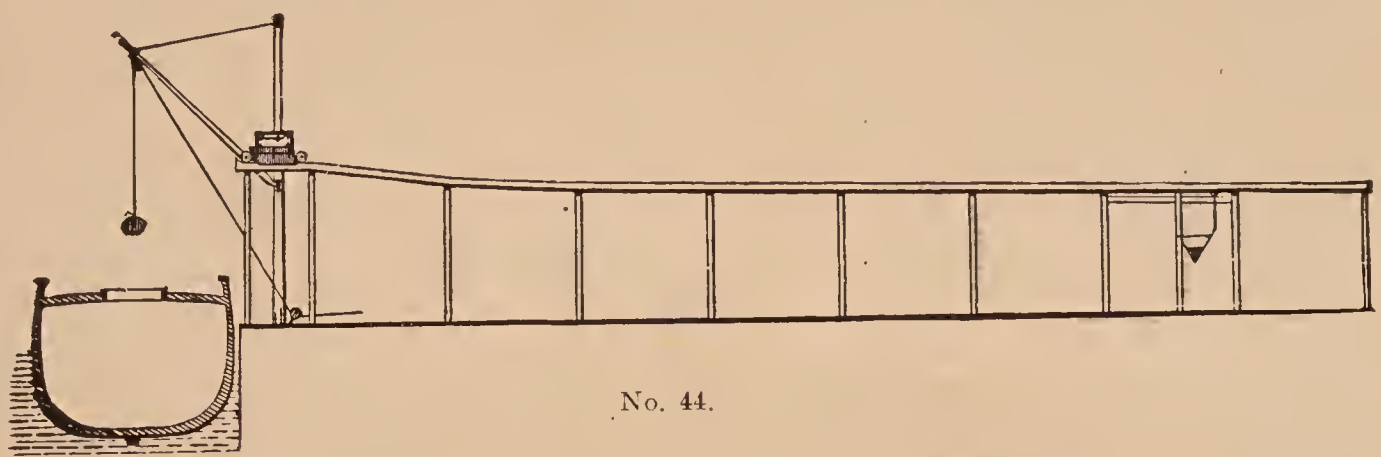
Persons who do not fully comprehend the hard usage coal machinery gets, or who do not fully understand the quality of our work, have supposed that our machinery is too heavy, and too expensive ; but experience has shown that for durability and freedom from repairs, it is not too heavy, as its general adoption by capable and successful business men in all parts of America amply proves.

There are now about 4,500,000 tons of coal, ore and phosphates, handled by this machinery each year, by ordinary workmen, whose care of the machinery in many cases is thoroughly bad, yet in all this time there has never been a breakage of anything that we have furnished that has caused the death of a workman, although coal handling is considered a dangerous business. While we cannot expect this record to always last, yet it has been exempt from serious accident so long that we take especial pains to have our machinery so carefully made and inspected, that the good record will continue, and the danger to the men working it, will be reduced to a minimum.



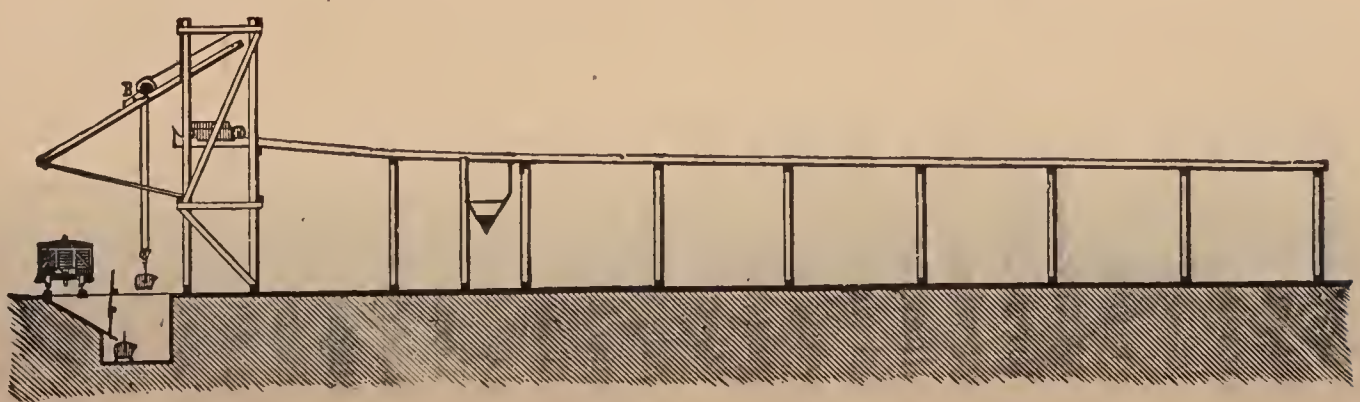
No. 3.

Side view of an Elevator and Automatic Railway for handling coal or ore.



No. 44.

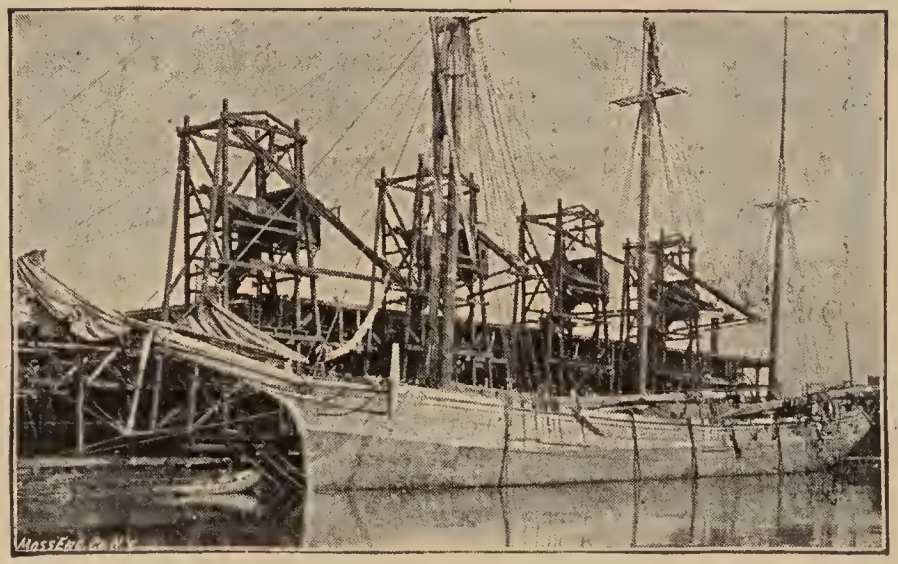
Automatic Railway, for handling coal with the ordinary mast and gaff.



No. 29.

Elevator and Automatic Railway, arranged to take coal from dump cars.

HUNT ELEVATOR.



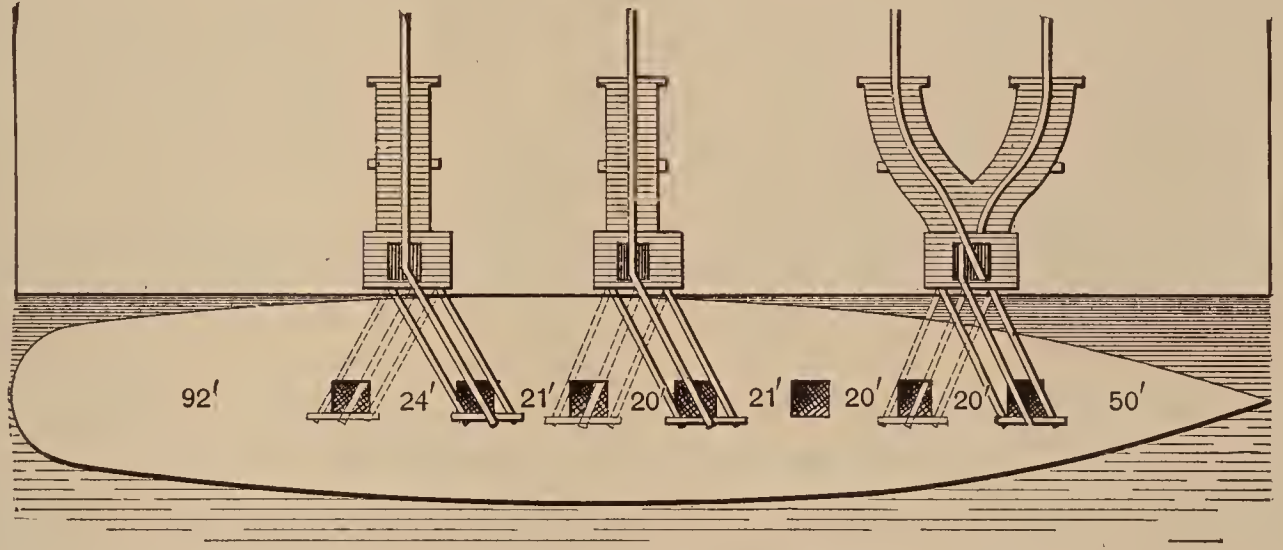
No. 106.

This elevator is designed for rapid and economical hoisting of coal and ore from vessels. Whenever the magnitude of the business, or the height of the hoist makes it unadvisable to use the ordinary mast and gaff, this elevator should be used. The bucket is carried from the hold of the vessel to its dumping place, every trip in exactly the same course, whether it is large or small, and at any rapidity which the business demands. The motions of the bucket are fixed, so that there is none of the ordinary swinging caused

either by a difference in the speed of hoisting or by the effect of wind. The bucket is carried exactly where it is wanted, rising vertically from the hold of the vessel to the booms, running up the boom and dumping at a fixed place.

These elevators are built of different sizes and proportioned to suit the work to be done. The lighter size is especially adapted for coal or ore hoisting, using any size bucket up to one ton capacity each. A heavier elevator is built for handling the steam shovel that is especially arranged for rapid and safe work. A third size is built of massive proportions for handling boxes containing 10 tons of coal for shipping from cars into vessels. In each of these styles the booms that project over the vessel are moved horizontally over the wharf when not in use. As they swing on a vertical axis one man can easily swing them into position, where they are held by guy ropes. The booms do not move while the elevator is in operation, but are swung to a position that will permit the steam shovel or bucket to drop vertically into the hold of the vessel. As it is sometimes difficult to get the hatch of the vessel directly opposite to the elevator, the booms are adjusted to swing sideways to bring the steam shovel or bucket to any desired point. The chock on the booms is movable so that the bucket can be made to descend at any point from the extreme outer end of the booms to the inner side of the vessel. In operation, the engine hoists the bucket vertically from the hold of the vessel until the running block attached to the tub strikes the truck on the projecting booms. As the engine continues to hoist the tub and truck, both run up the boom until over the hopper or car, when the bucket strikes a dumping attachment which dumps the load of coal out. The rope is then slackened, permitting the truck and the bucket to run down the booms until the truck strikes the chock, which arrests the motion of the truck. As the engine continues to pay out the rope, the bucket then descends vertically into the hold of the vessel, when the steam shovel fills itself

with coal, or in using ordinary tubs the hoisting block is unhooked from the empty tub and hooked on to a full tub, which the men have filled in the hold while the previous tub was being hoisted. In hoisting coal with a steam shovel but one is used, as it takes only five seconds for the shovel to fill itself with coal; but when the material is shoveled by hand, several tubs must be used—usually three—one being hoisted, one being filled, and a filled one being moved to the hatch ready to hoist when the empty tub is lowered. Where speed of



No. 30–Three stationary elevators. The shovel can be swung to the position shown by the dotted lines and work equally well.

unloading is slow, two can be used, but where the greatest speed possible is necessary, in large vessels, four and sometimes five tubs are used at one hatch, each carrying from 1,000 to 1,500 pounds of coal. When not in use, the whole projecting parts of the elevator swing sideways over the wharf, leaving the waterway unobstructed.

To unload from two hatches of a vessel at the same time, two elevators are used, they being erected as far apart as the average distance between hatches of the vessels to be unloaded.

When the hatches are closer together than the elevators, the booms of elevators are swung toward each other until they are in position to allow the tubs to descend into each hatch. If the hatches are further apart, the booms are swung away from each other in like manner. They can be adjusted to any position, even while in operation. When docks have a long water front, the elevators are set on double flange wheels running on a track parallel with the water front, or on top of the trestle work or the building. The engine is placed inside the elevator and the whole affair moves to any part of the wharf required. In this way the whole of the wharf front is available for hoisting, and only as many elevators are built as may be needed to unload at the requisite speed. In these cases the boiler is usually placed on the ground and steam carried by a pipe running parallel to the front of the wharf, from which the engine takes steam by connection at any point. It requires about the same effort to move the elevator on its track as to move an ordinary loaded freight car. These elevators have been built in all parts of the country to unload from all classes of vessels and barges, for use in quarries and in buildings, and variations in strength, the arrangement and the details have been made to suit almost all cases that occur in practice.

The earlier elevators were not as complete and elaborate as those now built, and as improvements were made one part would frequently, interfere with another, the bearing surfaces would not be sufficient, or sufficient precautions were not taken against carelessness in operation, but these difficulties were eliminated step by step until the present machinery embodies the experience of hundreds of men in all parts of the country, and in almost all conditions of work and operated by all classes of workmen. Elevators for coal hoisting, with the steam shovel or, for ordinary buckets, are made to standard size and the working parts to accurate gauge. They are always kept in stock ready for immediate shipment. Special sizes are made to suit any special work.

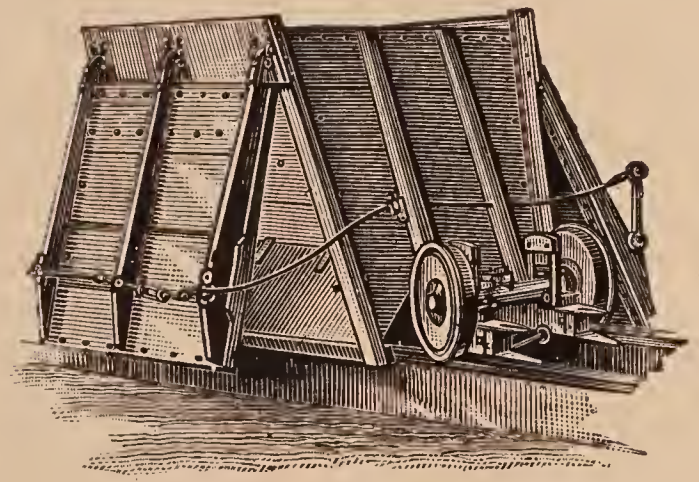
HUNT AUTOMATIC RAILWAY.

No. 2.

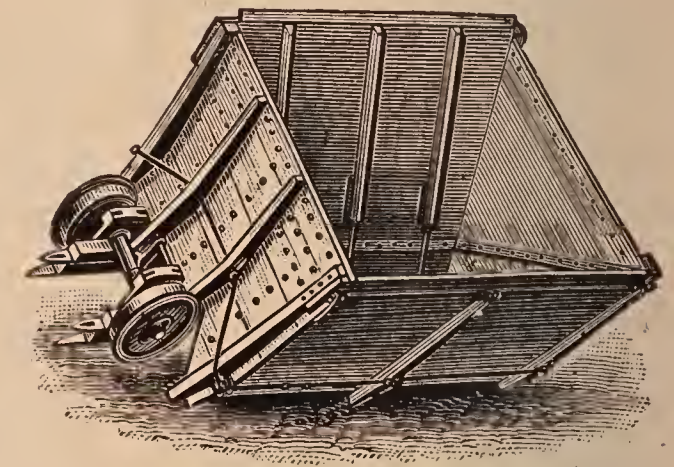
"The Automatic Railway" is now in general use for running the coal back from the front of wharf to the storage bin or pocket. It is an elevated self-acting railway, operated entirely by gravity, there is no steam, horse or manual power required in its operation. The chief peculiarity consists in storing sufficient energy which has been acquired by the loaded car descending an inclined track, which is utilized after the load has been discharged, to return the empty car back to the place from whence it started. The coal is hoisted from the boat, either by horse or steam power, and dumped into the car by an attendant. One man only is needed to operate the railway, who starts the car when filled, but does not accompany it. The car runs down the track, dumps its load at any desired point and

returns to the hand of the workman. It runs with great rapidity, making a trip of three hundred feet, dumping its load and returning in about thirty-five seconds. The car is so entirely automatic that it requires no attention whatever from the time of starting until its return to the workman for another load.

When a loaded car reaches the end of its journey it has raised a weight to a certain height, by means of a cable which the car picks up while running down the track;



No. 1024 —Regular Automatic Car.



No. 1016.—Special Automatic Car.

the fall of this weight is sufficient to return the empty car back to its starting point. The weight rises only a limited distance, its object is to give the car a start back, its momentum carrying it the remaining distance. Care has been taken to make the raising of the weight a gradual movement, so that as few sudden strains as possible are brought on the various parts. Great care has been taken in the proportions of the different parts to get this machine

perfectly automatic in its working, and at the same time be thoroughly durable and free from destructive wear or delays.

The regular cars used on this track discharge the load by opening the sides by means of a tripping block placed on the track, letting the coal run out on each side of the track. The bottom has a ridge in the centre so that the material runs entirely out; the sides are fastened, not to the car, but to each other, so that if one is unfastened, both are. The load is always discharged evenly and without danger of overturning the car, although it is a very narrow gauge.

The car is built of wood and lined with sheet steel in the best manner, with self-adjusting bearings, rubber springs and steel axles. The bearings are somewhat peculiar, as they are so arranged that the car runs around a curve of thirty feet radius theoretically as easily as on a straight line, and practically nearly as easily. A description of these bearings will be found in our catalogue on Industrial Railways.

The gauge of the track is narrow, twenty-two inches between the flanges of the wheels. The steel wire rope that raises the weight is detached from the car except during the time that the car is raising the weight and receiving the impulse to return; this permits the loading end of the track to be curved to suit almost any situation. The engravings illustrating the arrangement of tracks in various yards will show that the tracks can be adapted to almost any situation.

This railway can be easily erected in any yard, as there are no confusion of ropes, no switches or turn outs, no loose pieces to get lost or stolen, and there is nothing to take care

of or put away. The car is left just as it was used, and is ready for work at any time. The returning weight can be placed at any part of the track desired and be entirely boxed in and coal piled around it; it needs no attention whatever.

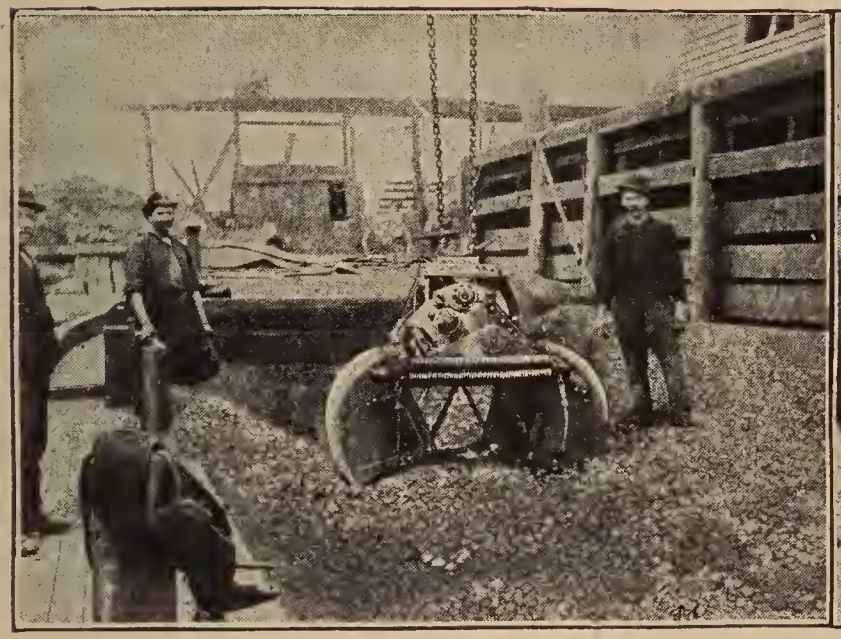
All material received over the railway can be accurately weighed without delay or extra expense, by placing platform scales in the track at the loading end, the workman who loads the car also weighs the load, and while the car is running down the track enters the weight in the tally-book.

The expense of storing coal with the Automatic Railway is reduced to the wages of one man. The expense is the same whether a small or large amount is handled.

We furnish the car complete, the steel wire rope, sheaves, cross-bars, spikes, fish joints and all the working parts, together with drawings for the erection. The intention is to furnish every part so that the purchaser will have no blacksmith or machine shop bills to pay. These automatic cars and all parts of the machinery are always kept in stock, and immediate shipments can be made.

The engravings of docks, fitted with the Hunt Machinery, show the extensive use of this railway and the great variety of situations it is adapted to. It is at work in so many places that it is but little trouble for those who are interested to go and see it in practical operation in any of the yards that are given in the list of users accompanying. As this is a special machine, to be built of such height and length as will suit each particular location, we would be pleased to have any party, thinking of using it, send us a description of his location, and we will then send a plan and an estimate of the cost without charge.

HUNT STEAM SHOVEL.



No. 154.—Ready to Close.

No. 155.—Four seconds later.

Shoveling coal in vessels is not only very hard work, but requires considerable skill, and owing to the intermittant character of the work and the desirability of discharging a vessel quickly, the wages paid are far above ordinary prices for labor. In most of the coal handling centers there are laborers who make a business of shoveling coal, and in many places they have formed a coal shovelers' union, and arbitrarily fixed the price not only for

the shoveling of the coal, but also for the hours in which they will labor and the number of men that will be permitted to work in a vessel at a time, and in many places they require the coal dealers to sign an agreement with them to respect their rules.

In handling Anthracite coal, all the breakage of the merchantable size to pea and dust is nearly a total loss to the dealer, and the reduction of this breakage is one valuable feature of the steam shovel. The scoops reach 7 feet, pushing their way under a ton to a ton and a half of coal, which causes very much less breakage than taking a ton of coal up in about 150 shovels full and dashing one on top of the other in a tub. Another feature is, that no men are at work under the shovel, as it fills itself entirely, and when men are needed in the hold it is not to assist the shovel, but it is to scrape the coal out from under the deck where the shovel cannot reach, so the men are not working under the shovel as they do in ordinary coal hoisting. It picks up the coal as clean as can be done by a hand shovel, and does not, and cannot injure the ceiling of the vessel in the least. The handling of this shovel by the engineer is an extremely simple matter, a single drum-hoisting engine of sufficient power hoists the shovel up, and when it reaches the top of the booms over the hopper, the shovel automatically dumps itself. The engineer has nothing to do except to hoist it up to the designated point, it is then lowered into the hold of the vessel, with the scoops open, ready for filling. The engineer then starts his engine, when the shovel automatically fills and is hoisted the same as the preceding one. There is no more skill needed in hoisting this shovel than in hoisting the ordinary tub, and in most cases it requires less skill, as we attach to all our engines for this purpose, a governor that runs the engine at the correct speed at every point

in the hoist, changing it from slow to fast. and from fast to slow, automatically, so that the engineer in hoisting throws the throttle wide open and leaves it open until the shovel has dumped its load in the hopper, the governor varying the speed of the hoisting engine exactly as it was set to do for accomplishing the best work.

The saving in the expense of unloading a vessel with the Steam Shovel is very great. The average expense for the workmen who attend to the shovel in the vessel is usually not over one cent per ton and the total labor expense of unloading the coal from the vessel, accurately weighing it and storing it in coal pockets ready to draw into the carts, is in many places less than two cents per ton, and in no case heretofore has the expense been greater than three cents per ton. The wear and repairs of the machinery are very slight indeed. The expense for hoisting chain is almost exactly the same amount per ton of coal hoisted as manila rope to hoist the same quantity, and the repairs to the shovel in a series of years would probably not exceed 1-10th of a cent per ton.

In vessels suitable for the steam shovel no shovelers are required, the shovel filling itself automatically and the whole cargo is discharged without shovelers, with the exception that coal in the corners of the boats must be scraped out so that the shovel can reach it. In many vessels the hatches are so large that nearly all the cargo is discharged before a workman enters the boat for any purpose. In less convenient vessels, it is necessary to have one and sometimes two men to assist in getting the coal out where the shovel can reach it. In large vessels having hatches, as large a proportion of the cargo cannot be taken out with the shovel as in those that are made especially for coal carrying. In big

vessels, the amount that it would be necessary to shovel forward would vary from a small percentage to 10 or 12 per cent. where the hatches were inconvenient. The steam shovel carries from one ton to one ton and a half per load and makes about one trip per minute, so that the speed in unloading is at the rate of from 60 to 80 tons per hour, and at times, when everything is favorable, over 100 tons per hour. The usual amount taken out in ten hours, taking into consideration all the delays that usually occur in shifting from hatch to hatch, and in cleaning up the vessel, runs from 450 to 550 tons at one hatch.

In the construction of the shovel the greatest pains are taken in the materials and workmanship, to secure immunity from delay and durability in use. Every part is made to a standard templet so that in case of an injury to any part, it can be renewed at once with a certainty of a fit. All the bearings in the shovel are bushed with bronze bushings that can be pushed out and a new one inserted in its place, as they are all made to templets. In this way, no matter how long the shovel is in service, the working parts can be kept in as perfect order as when it was first received.

The advantages of this Steam Shovel are :

That it fills itself automatically.

It reduces the breakage of coal

It reduces the expense and increases the speed of discharging.

It is safer for the workmen.

A single drum engine is used.

There is no swinging or twisting in hoisting.

HUNT HOISTING ENGINE.

The power of steam-hoisting engines has kept pace with the increase in the size of the tubs and the speed of hoisting. At first engines were small, having but one cylinder, 5 or 6 inches in diameter; now our regular engine is five times as large, having two cylinders $8\frac{1}{4}$ inches in diameter, and our steam-shovel engine eight times as large, having two cylinders, each 10 inches in diameter. This increase in the size of the engine takes no more steam to hoist a single ton of coal than the small one did, but it hoists it more rapidly, permitting more coal to be hoisted in a day. An engine that is abundantly able to do this work is more durable and more free from trouble in the bearings and the steam-joints. In the earlier engines, the drum upon which the rope wound was quite small, but it was found that when the rope had wound up on the drum in one layer and mounted to commence a second layer, that the chafing of the rope made it fail at this point; for this reason we have enlarged the drums of our engines until they are 34 inches in diameter and long enough to wind up 150 feet of $4\frac{1}{2}$-inch rope in one layer.

For rapid and economical work, the engines lower the bucket by friction, the engine standing still while the bucket is descending. In case of any injury to this, a brake is also added, which the workman operates by his foot. This is only used to hold the bucket in mid air or when the friction from some accident fails to hold. Our hoisting engines are fitted with this brake, and friction clutch and an improved throttle valve, all the levers being so arranged that they are convenient for the engineer to operate either while watching his bucket in

hoisting or lowering. The levers can also be extended to any distance that it is necessary to have the engineer located, so that he can see every part of the work he is doing.

Our Steam-Shovel hoisting engine is fitted with a special governor that runs it fast when the bucket rises vertically from the boat, slows the engine when it reaches the booms, runs it fast up the booms and slows up to dump. This is done automatically while the engineer has the throttle wide open. The object of this is to increase the speed of hoisting as well as for safety, by reducing the constant strain on the nerves of the engineer. He hoists with the throttle wide open, paying no attention to it except when the shovel is started from the hold of the vessel, throwing the throttle wide open, the governor taking care of the speed entirely until the shovel is dumped He cannot by any possibility run the engine at an excessive speed when the shovel reaches the boom or when it is dumping. He could turn his back on the engine when hoisting at full speed, with the throttle wide open, as it needs no attention until the shovel has dumped in the top of the elevator. In case of necessity, an ordinary laborer could run the engine fairly well. This governor differs from the ordinary governors, as they are intended to run the engine at a regular speed, while this one runs the engine at an irregular speed. This governor is fitted to our regular hoisting engines when ordered.

The steam for running hoisting engines is usually furnished on small wharves by a vertical boiler. These boilers are of small cost and strong, but are not as economical in fuel or as free from repairs as the better class of stationary boilers. They are usually used because there is but little room on the wharf for the boiler or on account of the smaller first cost. Where the space is very limited we furnish boilers on the same bed plate as the engine; but where there is room it is advisable to separate the engine and the boiler a few feet in order to prevent the ashes from flying on the working parts of the engine.

A stationary boiler of ample steaming capacity, which will require less fuel, less attention

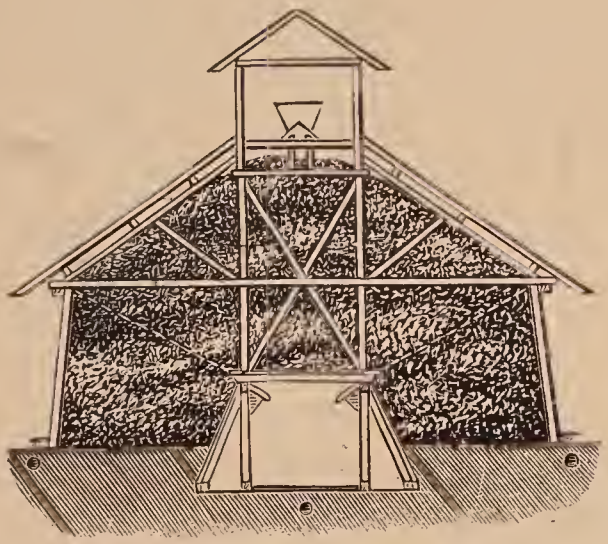
and less repairs, is advisable in all cases when it can be used for boilers of 50 to 100-horse power, an excellent form is shown in the engravings 93 and 1159, which are modifications of the Scotch Marine Boiler, universally in use on ocean steamships.

These boilers require no brick work ; are structurally the strongest of all forms of boilers, and every part both inside and outside can be reached for examination or repairs. There are

No. 93.

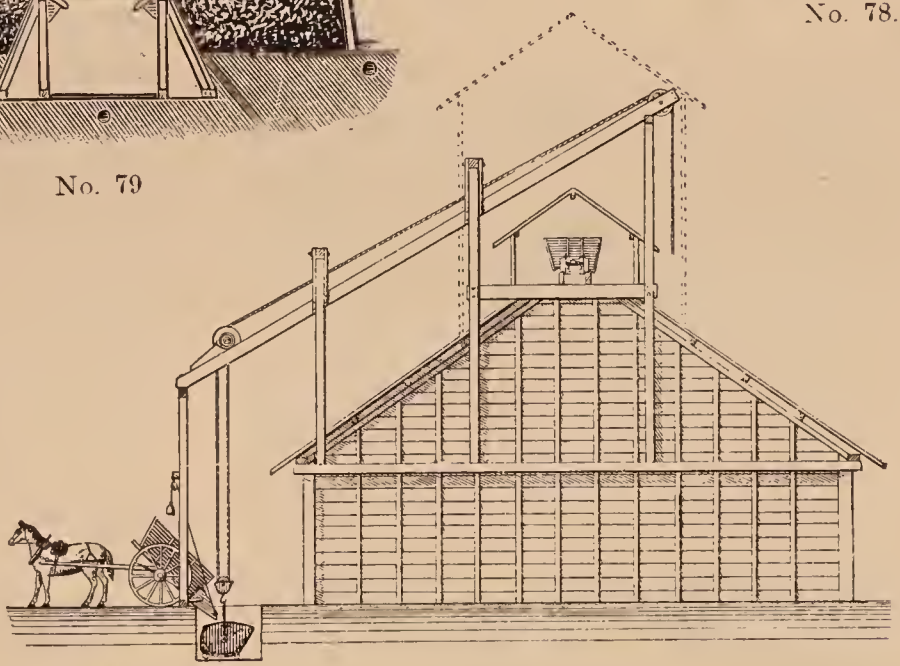
no stay rods or bolts used with the exception of the stays required on the front and rear heads between the upper row of tubes and the top of the boiler.

We furnish all classes of engines and boilers for hoisting, making a specialty of those described above, which are kept in stock ready for immediate delivery. We would be pleased to answer any inquiries and quote prices for any size or style of hoisting engine, for stationary or upright boilers.

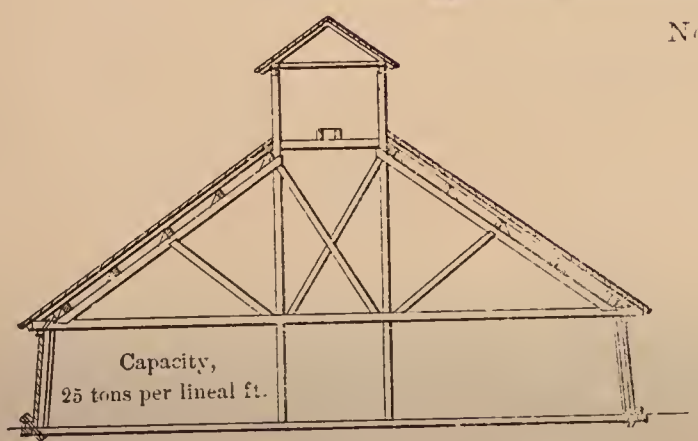


No. 79

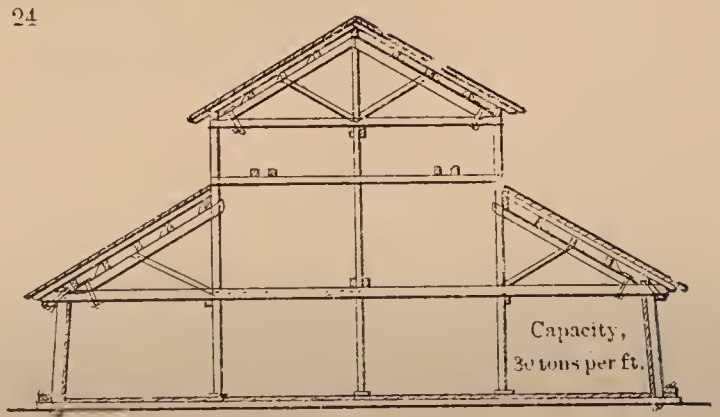
No. 78.



No. 24



No. 10.



No. 9.

COAL STORAGE BUILDINGS.

We make detail plans and specifications for all classes of Coal, Phosphate, Rock and Ore Buildings. Also wharf and piling plans.

COAL POCKETS AND STORAGE SHEDS.

Coal dealers know, by experience, that great strength is required in the timber-work in bins or sheds for storing coal. To get this strength so that there will be no pressing out of the sides of the bin and at the same time not put in an excessive amount of timber, it is an important matter both in the first cost and in the maintenance afterwards, that the most approved plan should be adopted.

Since 1873, we have made plans for a great many coal buildings of various kinds that have been built in different parts of the country, and as a result of our experience and observation of this class of buildings, believe that certain methods of construction are better and also cheaper than the usual ones adopted by carpenters and builders, and we have adopted them in our designs. A great economy in the timber-work can be made by proportioning the size of each timber to the strain it has to bear, and where piles are used to so space them that each gets an equal load. Timber-work to be durable should have a breaking strength of at least eight times the amount of the permanent load upon it, and especial pains taken that it is not weakened in framing. Every piece should be framed so that in case of need it can be taken out and a new one inserted without disturbing other timbers, and if possible, should have a circulation of air so as to prevent decay.

Another point that should be carefully considered in the construction of the building is the location of the chutes for drawing the coal into the carts; they should be located in the most convenient position for use, and in such a way that no timbers need be cut away to make room for them, and so that the coal will be as completely drawn from the pocket as it is possible to do; the chutes most suitable for Anthracite coal are shown elsewhere. Bituminous

coal requires a very much larger opening, and cannot in any case be made to run as freely as Anthracite.

In tying the sides of buildings together, we have for many years used timber instead of iron rods, believing it to be very much better and also cheaper. Where rods are used, they bend down as the coal settles. Another difficulty is that in warm weather the rod expands with the heat and permits the sides of the coal bin to spring outward ; then a lower temperature will contract the iron and as the coal is too rigid to press upward the bolt either breaks or the bolt-head settles into the wood, as may be seen in almost any building tied together with iron rods. The use of timber entirely obviates both these troubles, and is less expensive. By placing the tie-timbers edgewise they will not break by the settling of the coal and a very secure fastening can be made, as shown in the engraving No. 1037.

We have never known a fastening of this kind either to give way or show signs of weakness. Another feature in the plans of our coal pockets is that the posts do not run up through the pocket, even at the corners. The posts are short and capped with long timbers and the superstructure erected on these as upon a foundation. This permits any timber in the building to be removed in case of decay, without disturbing the others. This also permits the use of short timber, that costs less per thousand. We have designed large coal pockets where, for special reasons, there was no piece over six inches thick, or longer than sixteen feet.

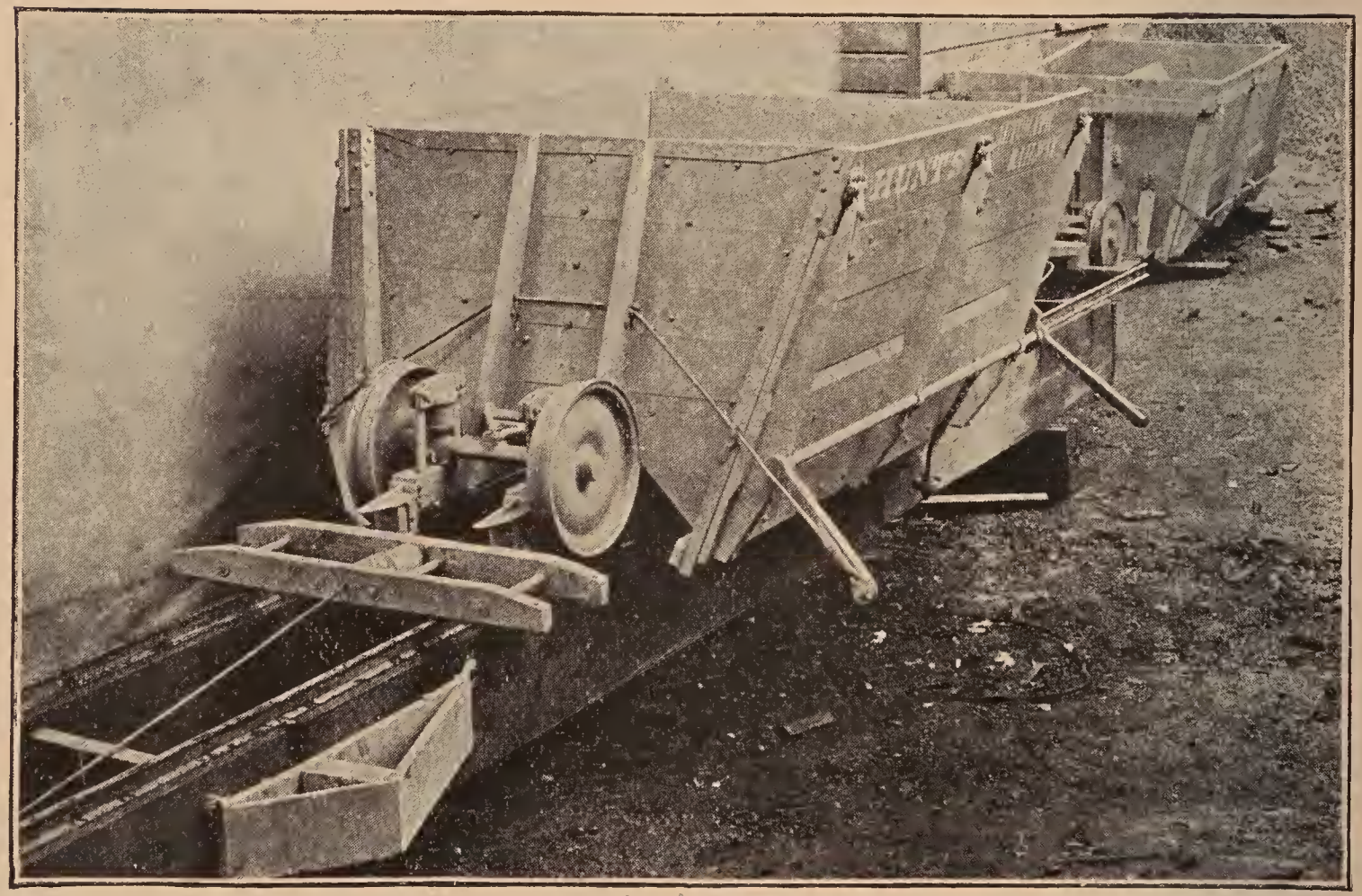
Where coal is received and delivered immediately, the advantage of coal pockets high enough to spout the coal directly into the carts is very great, as it effects a saving in the time in loading carts and wagons of about twenty minutes to a ton, and at the same time screening the coal better than it can be done by hand and depositing the pea and dust in a receptacle between the posts to be removed at leisure. A far greater amount of business can be done on the same area, and less yard men are required. In the vicinity of New York the capacity

of the pockets is about one-tenth the yearly sales. The more frequently coal is received the smaller can be the size of the pocket in proportion to the annual sales. It is not usually economical to store coal in a pocket, as the interest on the cost and the depreciation of the pocket amounts to over twenty cents per ton for one year.

Coal pockets holding from a thousand to four thousand tons require 70 to 80 feet of lumber, board measure, for each ton capacity. By adding to the cost of the lumber twelve or fourteen dollars per thousand feet for the carpenter work, a very close estimate of the cost of a coal pocket can be made; to this must be added the cost of the foundation and the coal handling machinery. The cost of storage sheds is from fifty cents to one dollar and a quarter for each square foot of ground covered. Storage sheds require special designs to suit different locations and materials to be stored. Several examples are given in the illustrations following; some of these cover as much as five acres.

Many advantages of a coal pocket can be had by building a tunnel (shown in cut No. 79) in the yard or storage shed. A cart drives in the tunnel, a valve is opened and the coal runs into the cart over a screen until loaded, in the same manner as in a pocket. It answers all the purposes of a coal pocket for all coal higher than the top of the valve in the tunnel; the coal below must be screened and loaded in the usual way. Many of these have been built and work economically, costing very much less to construct than a coal pocket. In addition to the timber needed for the building there will be needed about three hundred and fifty feet of lumber for each foot in length of tunnel.

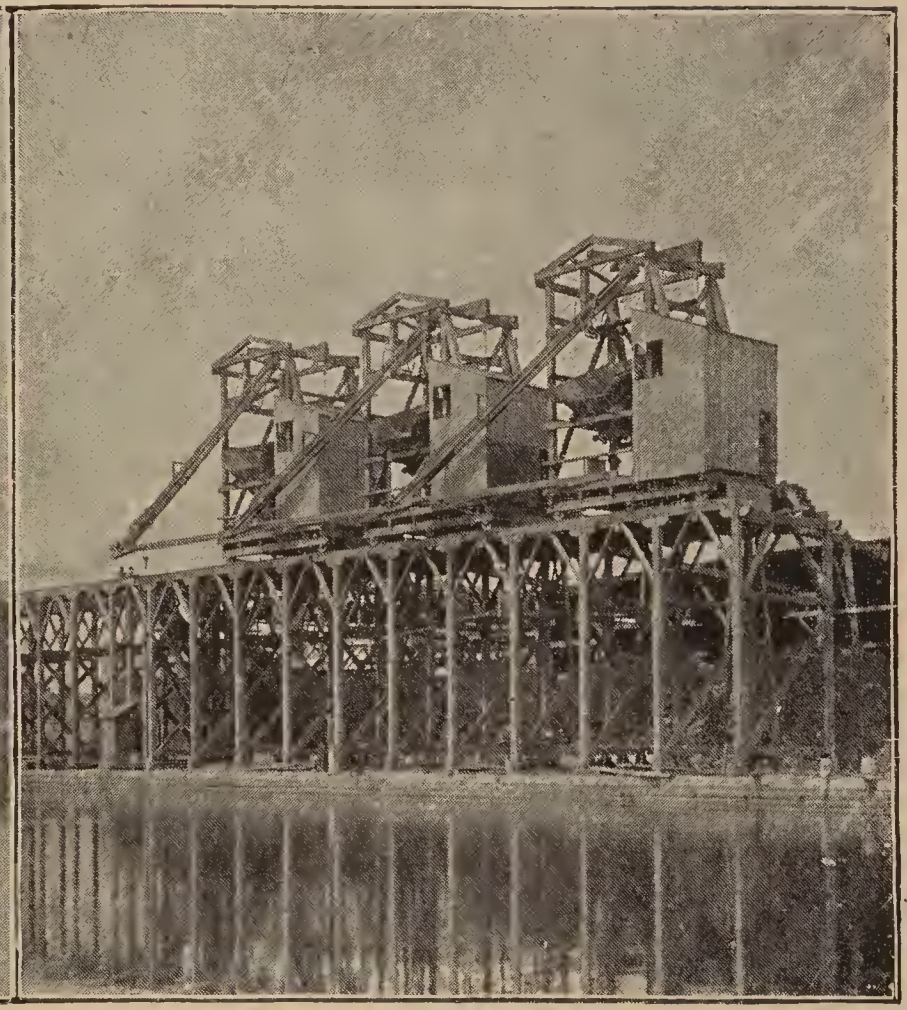
We furnish to parties who think of erecting coal pockets, storage sheds or wharves and foundations, preliminary plans without charge; but when more detailed building plans or specifications are needed, we make a reasonable charge for the time consumed in preparing them.



No. 1140.

Automatic Railway Car, with Truck, Dumping Block, Cross-bar, &c.
For description see article on "Automatic Railways."

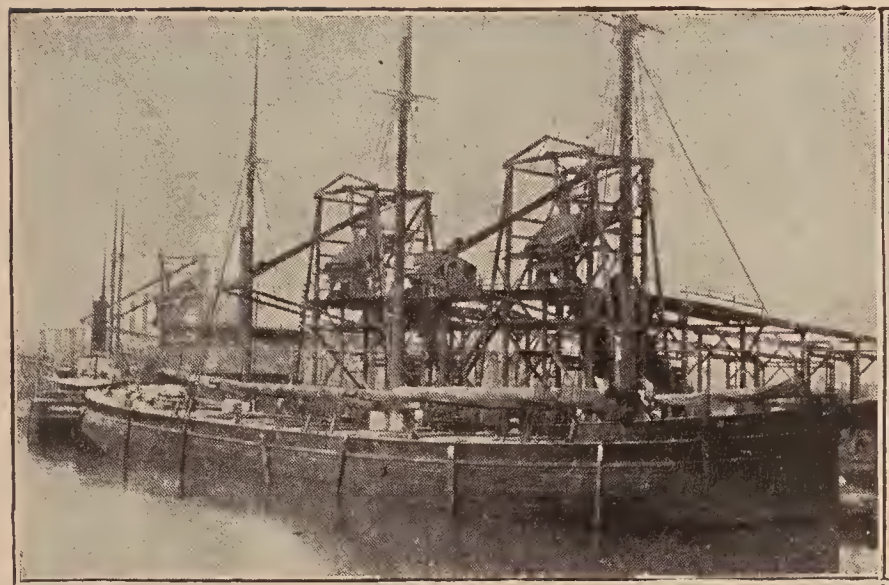
No. 99.



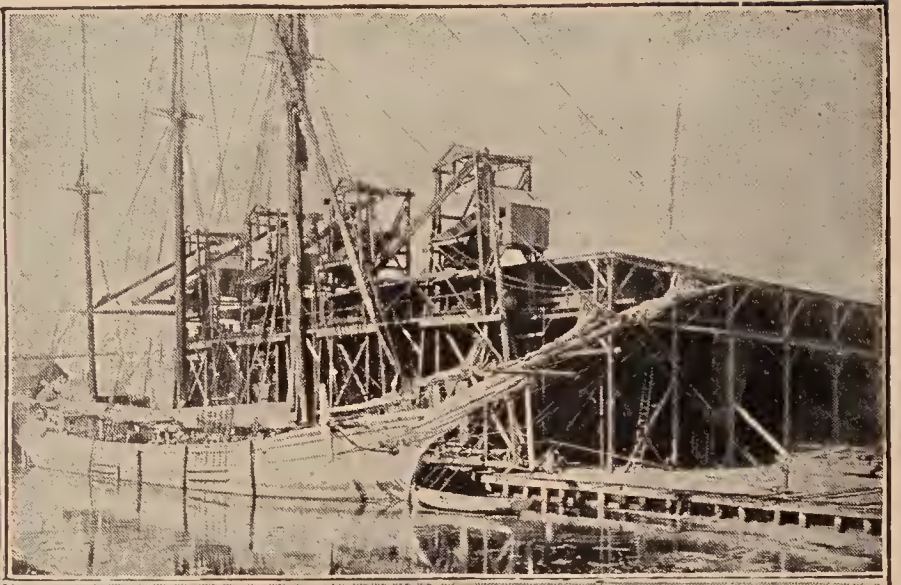
No. 100.

99 —New York Gas Light Co. Two Elevators and Automatic Railways.
100 —R. P. Elmon & Co., Milwaukee, Wis. Three Elevators and Automatic Railways.

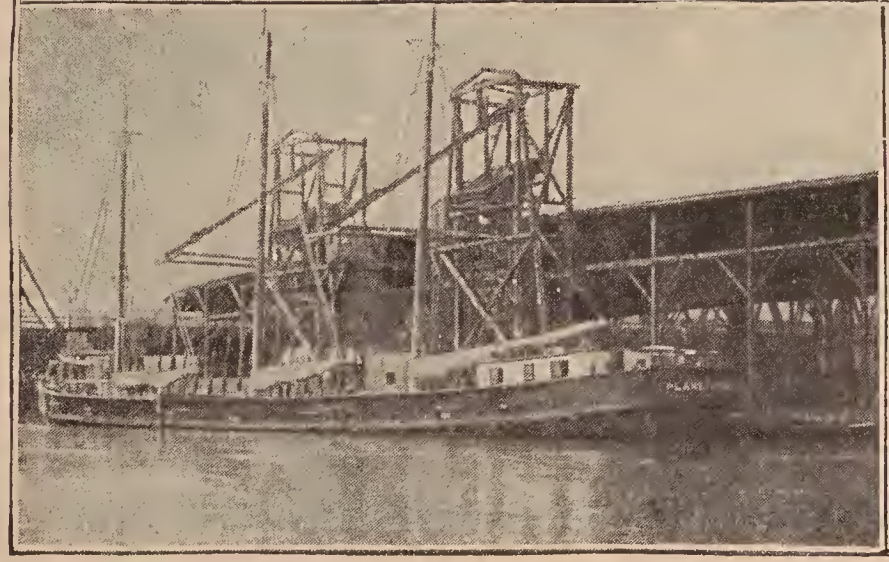
No. 109.



No. 124.



No. 121.



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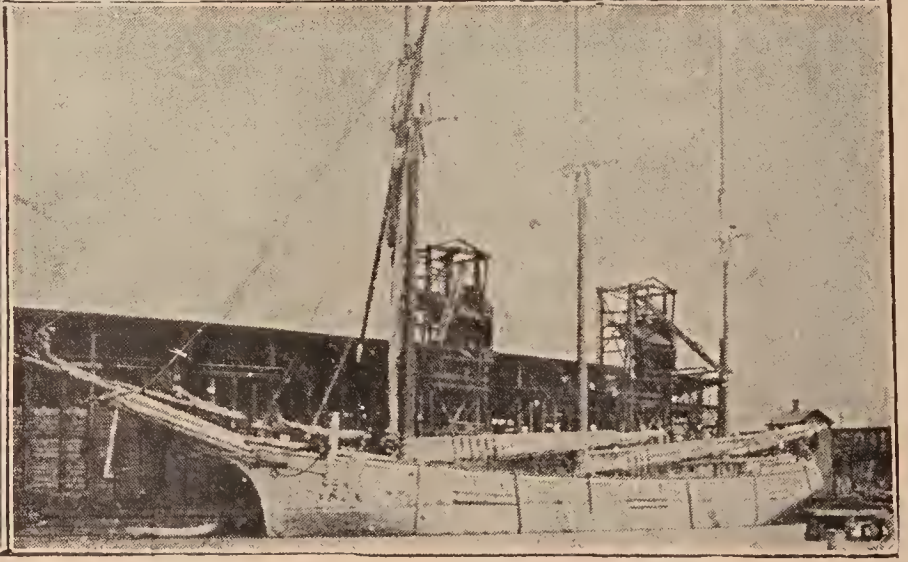
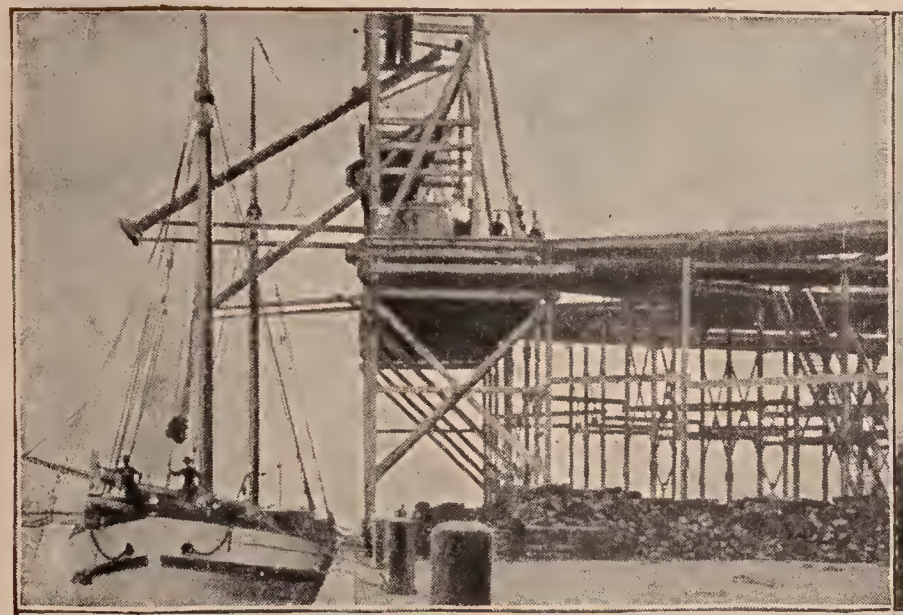
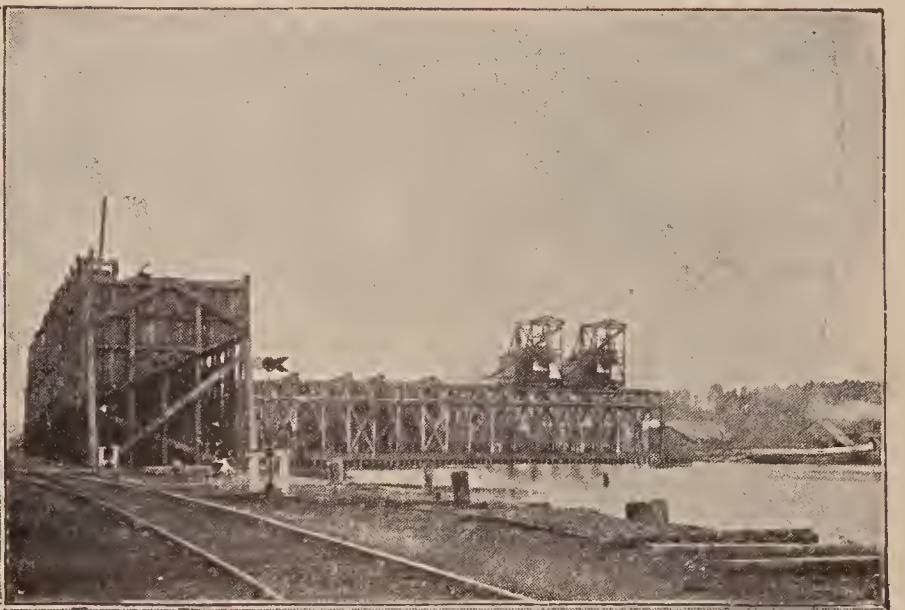


No. 109.—Joliet Steel Co., Chicago, Ill. Six Elevators and Automatic Railways for handling Iron Ore.
No. 124.—E. L. Hedstrom & Co., Chicago, South Side Yard. Four Elevators and Automatic Railways.
No. 121.—Baker Bros., Chicago, Ill. Two Elevators and Cars.
No. 123.—J. L. Hathaway, Chicago, Ill., Kingsbury St. Yard. Two movable Elevators and Automatic Railways.

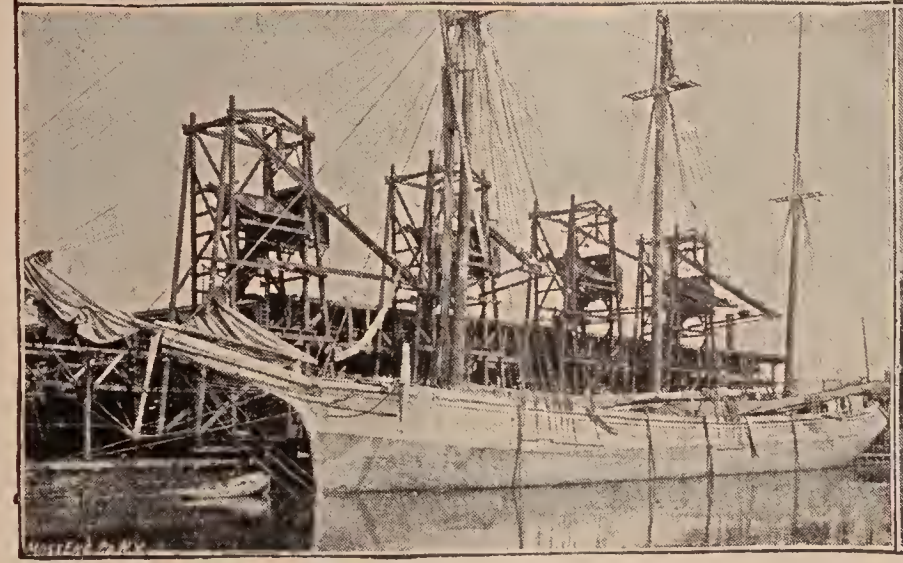
No. 115.



No. 114.



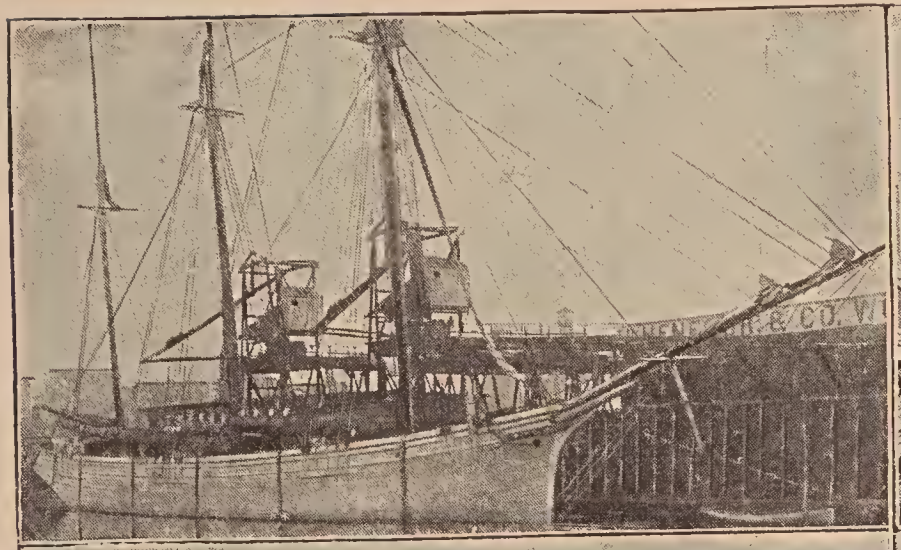
No. 106



No. 117.

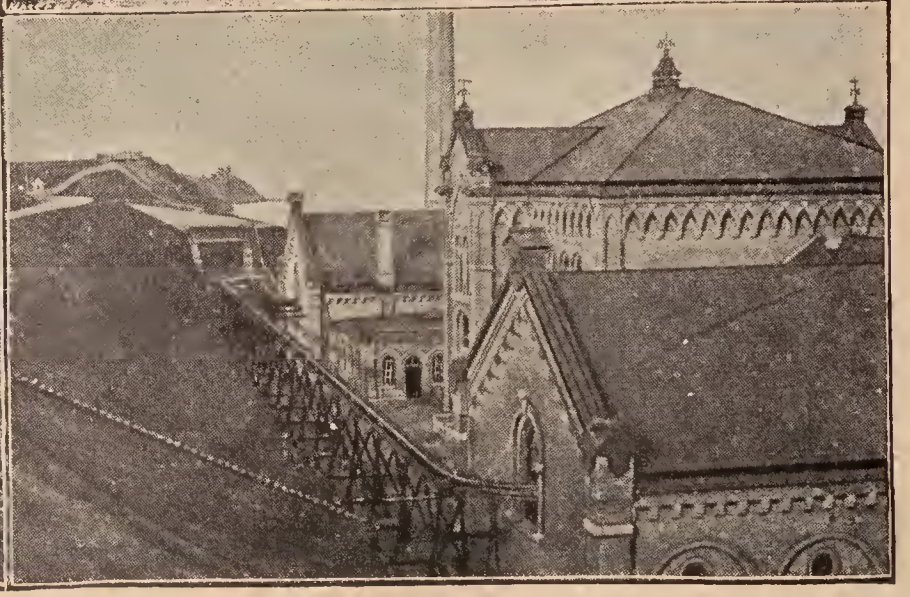
No. 115.—Calumet and Hecla Smelting Co., Lake Linden, Mich. Four Movable Elevators and Automatic Railways.
No. 114.—Columbus & Hocking Coal and Iron Co., Manitowoc, Wis. Four Movable Elevators, Automatic Railways and Pockets for Coaling Locomotives.
No. 106.—Pennsylvania Coal Co., Milwaukee, Wis. Four Movable Elevators.
No. 117.—J. Conroy & Co., Charleston, S. C. Elevator and Cars.

No. 112.



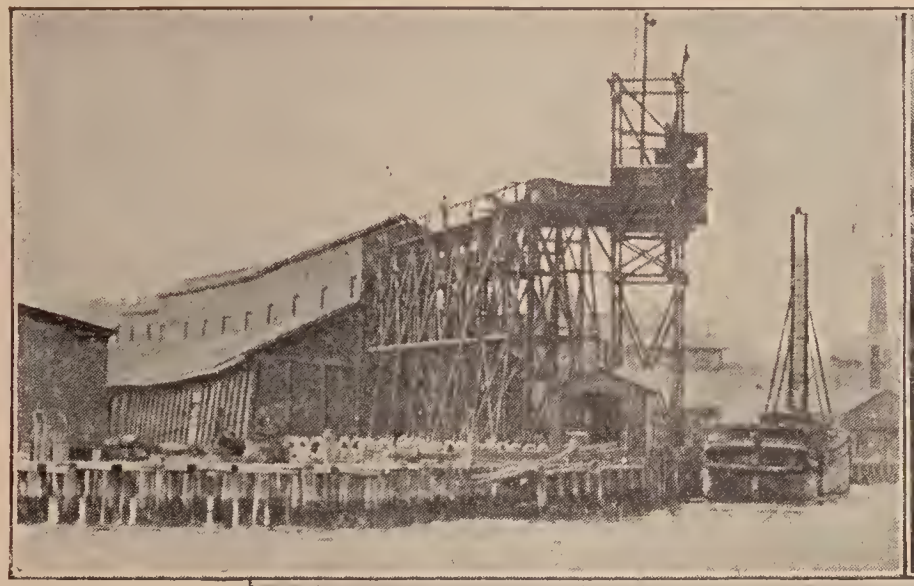
No. 107.

No. 119.



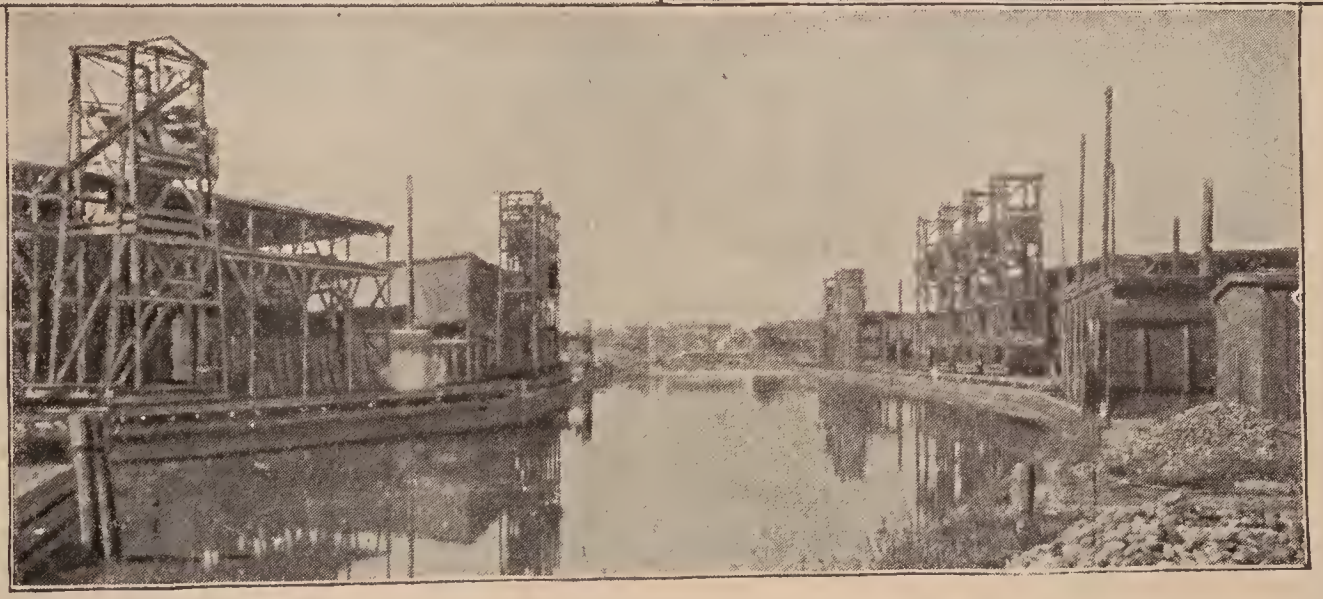
No. 131.

No. 112.—Louis Henes, Jr., & Co., Milwaukee. Two Elevators and four Automatic Tracks.
No. 107.—Union Ferry Co., Brooklyn, N. Y., Atlantic Ave. Ferry. Elevators and Automatic Railways.
Similar plants are at the Catherine and Hamilton Ferries.
No. 119.—G. H. Nichols & Co., Brooklyn, N. Y. Elevator and Automatic Railway.
No. 131.—Milwaukee City Water Works. System of Tracks and Cars for Coal handling.



No. 138.

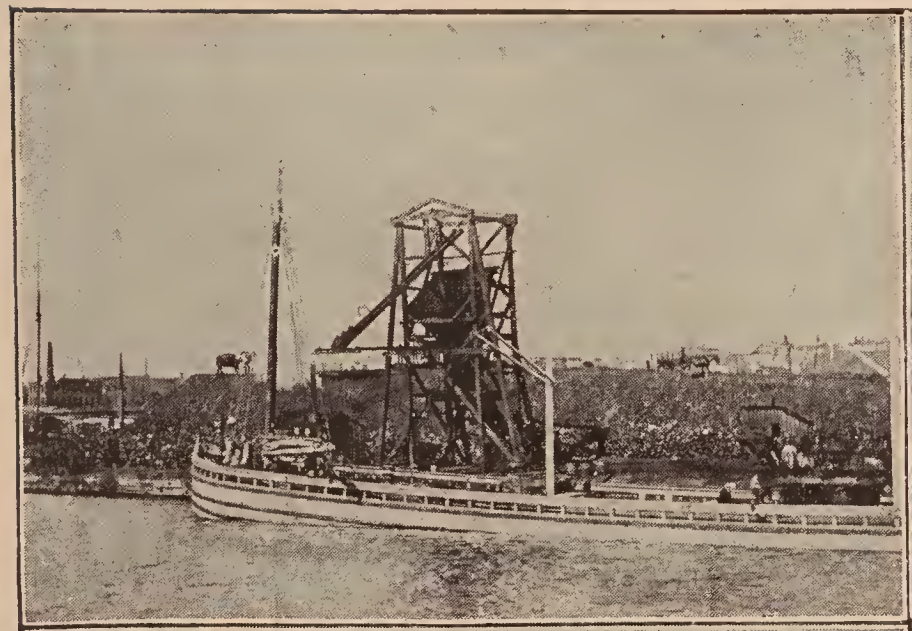
No. 132.



No. 94.

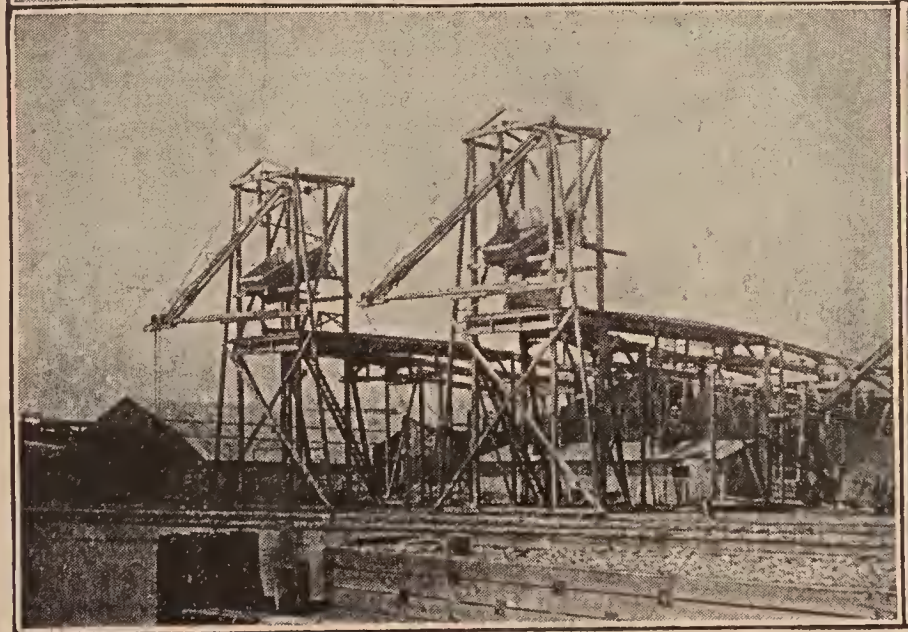
No. 138.—New Haven Gas Light Co., New Haven, Conn. Elevator and Automatic Railway.
No. 132.—Connecticut Asylum for the Insane, Middletown, Conn. Elevator and Automatic Railway.
No. 94.—Coal Handling Machinery in Milwaukee, Wis. H. M. Benjamin, Pennsylvania Coal Co. and R.P. Elmore Co.

No. 137.



No. 133.

No. 139.



No. 130.

No. 137.—George E. Shield's Brockville, Canada. Elevator.
No. 133.—Union Elevated Railroad, Brooklyn, N. Y. Steam Shovel, Elevator and Automatic Railways.
No. 139.—Ogdensburgh Coal and Towing Company, Montreal, Canada. Two Elevators and Automatic Railways.
No. 130.—Pawtucket Coal Company. Automatic Railway.

No. 108.

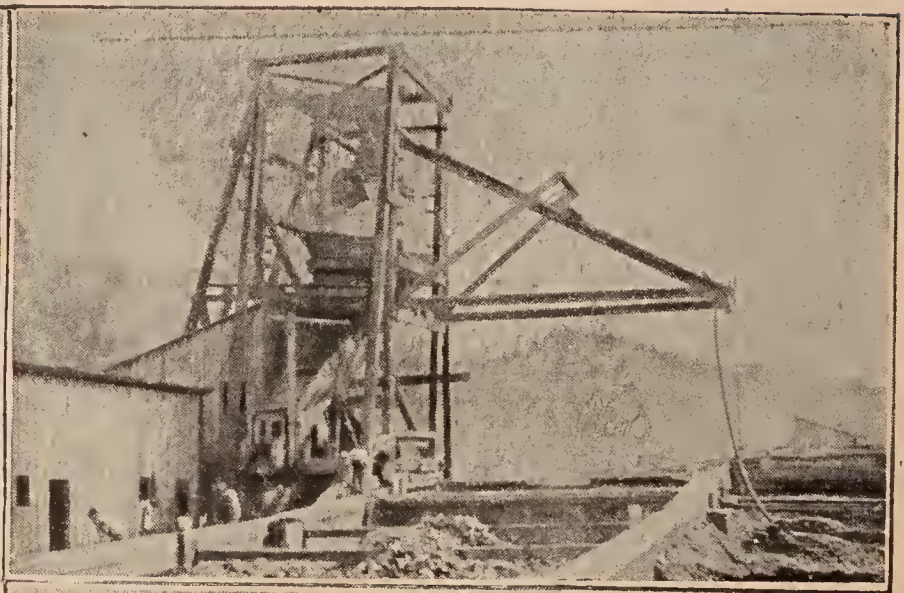
No. 113.

No. 104.

No. 120

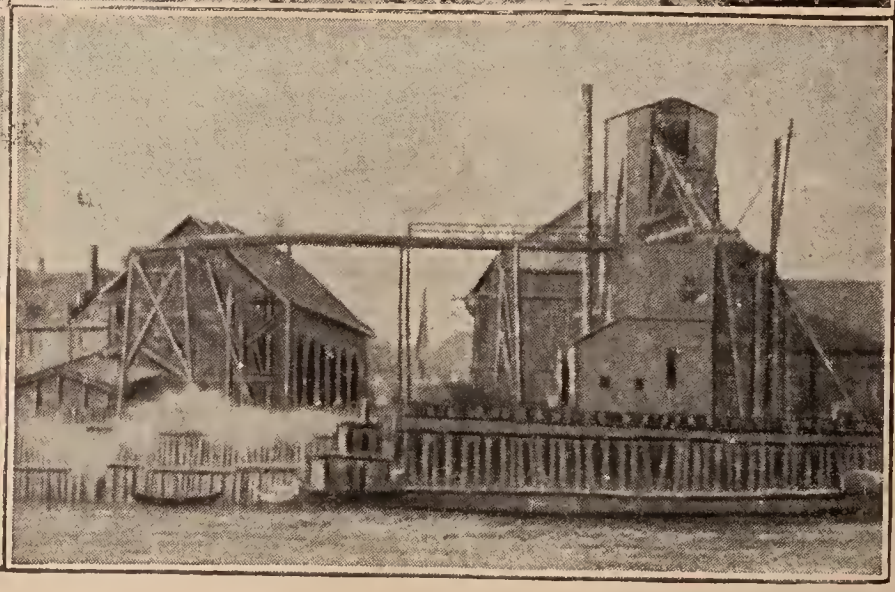
No. 108 —Lehigh and Franklin Coal Co., Milwaukee, Wis. Four-mast Elevators.
No. 113 —C. H. Reynolds & Sons, Brooklyn, N. Y. Elevator, Automatic Railway and Coal Pocket.
No. 104.—Charles Warner & Co., Wilmington, Del. Elevator, Automatic Railway and Pockets.
No. 120 —Equitable Gas Light Company, New York. Two plants. Steam Shovel, Elevator and Automatic Railways.

No. 122.



No. 105.

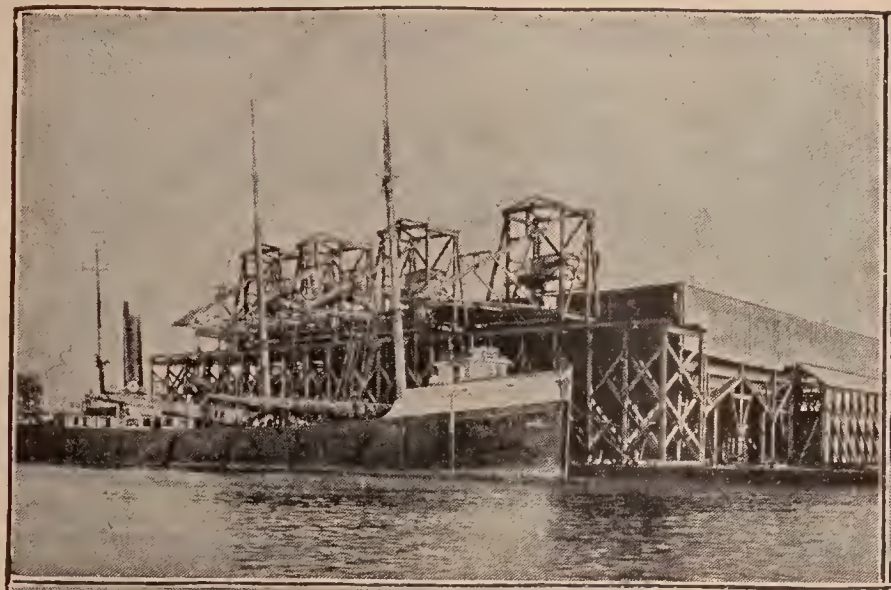
No. 125.

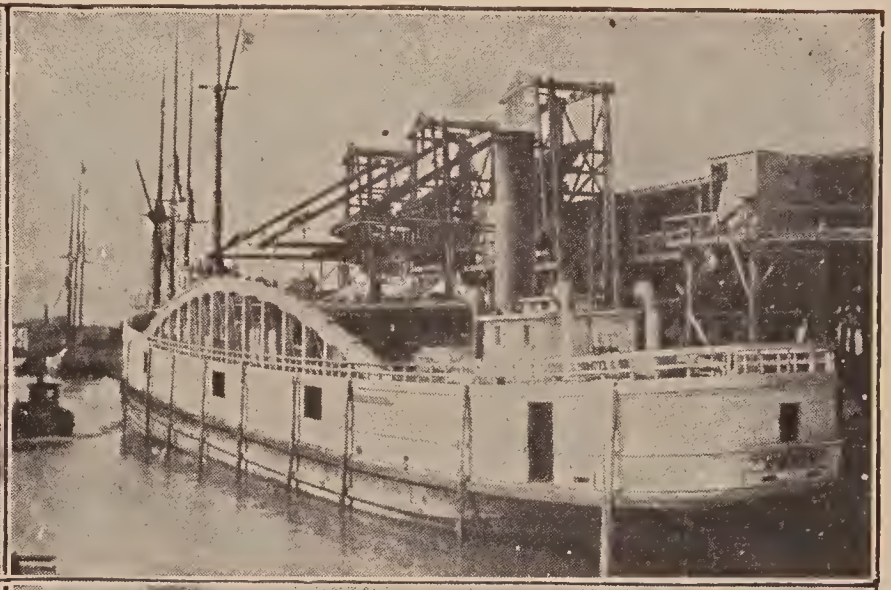


No. 140

No. 122.—H. L. Herbert & Co., Coal yard, 20th St., E. R., N. Y. Steam Shovel, Elevator, Automatic Railway and Coal Pockets.
No 105.—Lysle Crow & Co., North Bend, Ohio. Steam Shovel plant on a float.
No. 125.—Hencken & Co., foot E. 4th St., New York. Steam Shovel Elevator, Automatic Railway, 675 ft. long and Coal Pockets.
No. 140.—J. J. Poole & Co., Hartford, Conn. Steam Shovel Elevator, Automatic Railways and Coal Pockets.

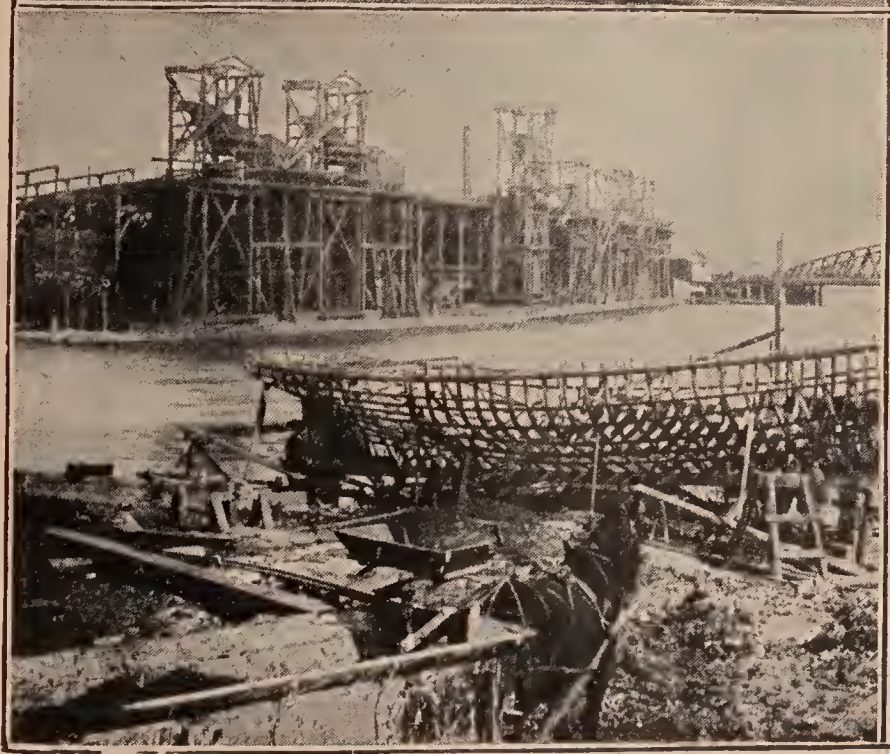
No. 116.





No. 110.

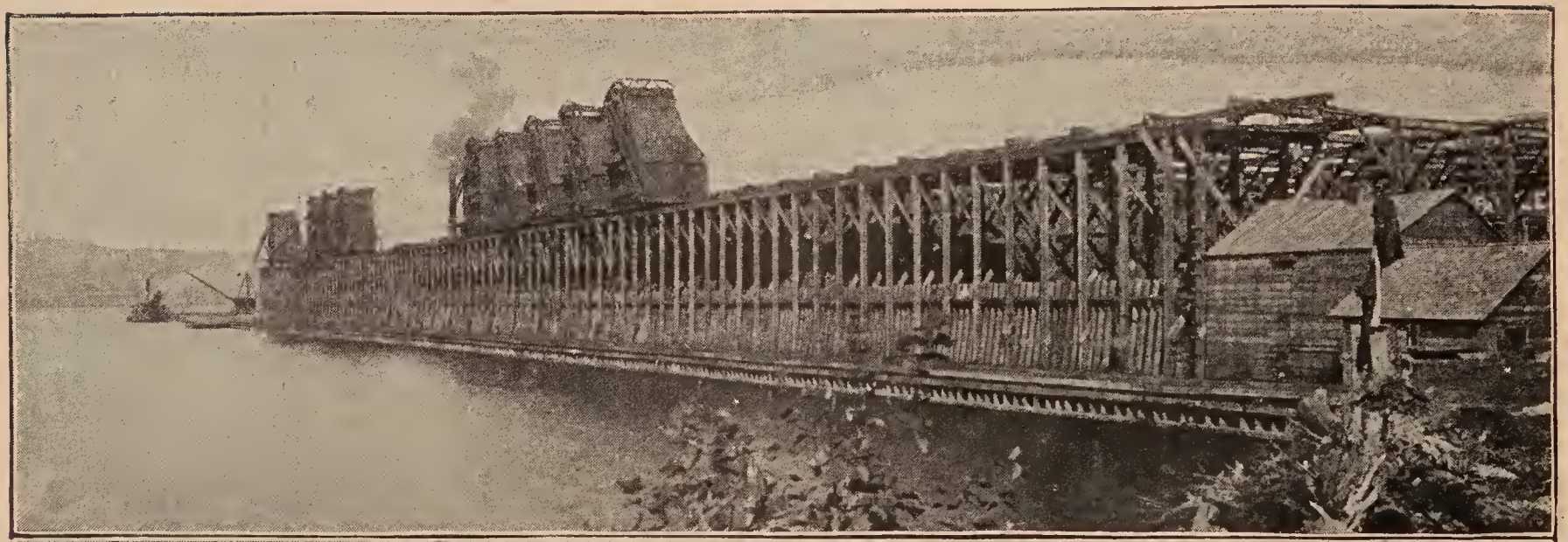
No. 101.



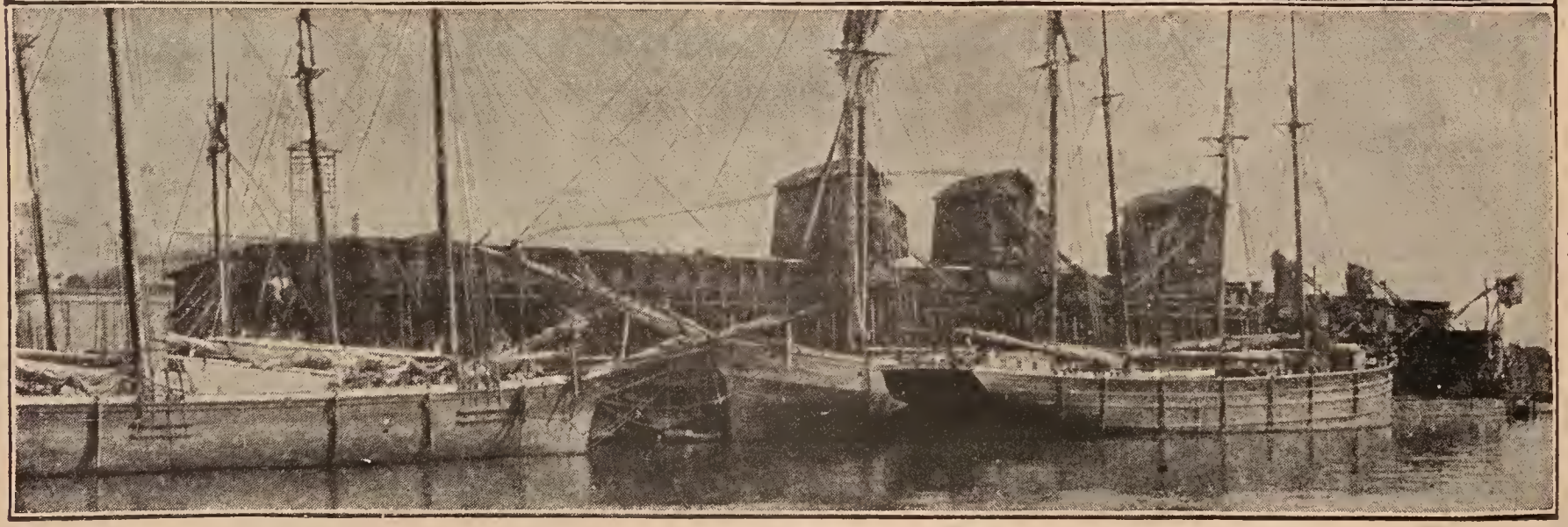
No. 103.

No. 116.—E L Hedstrom & Co., South Chicago. Four Elevators, Automatic Railways and Coal Pockets.
No. 110.—Pennsylvania Coal Co., Chicago, South side yard
No 101.—Robert Law, Chicago, Ill. Six Elevators and Automatic Railways. The coal shed covers five acres.
No. 103.—Brooklyn Sugar Refining Co., Brooklyn, N. Y. Elevator, Automatic Railway and Coal Pocket.
The Automatic car track is 80 feet above wharf.

No. 96.



No. 95.



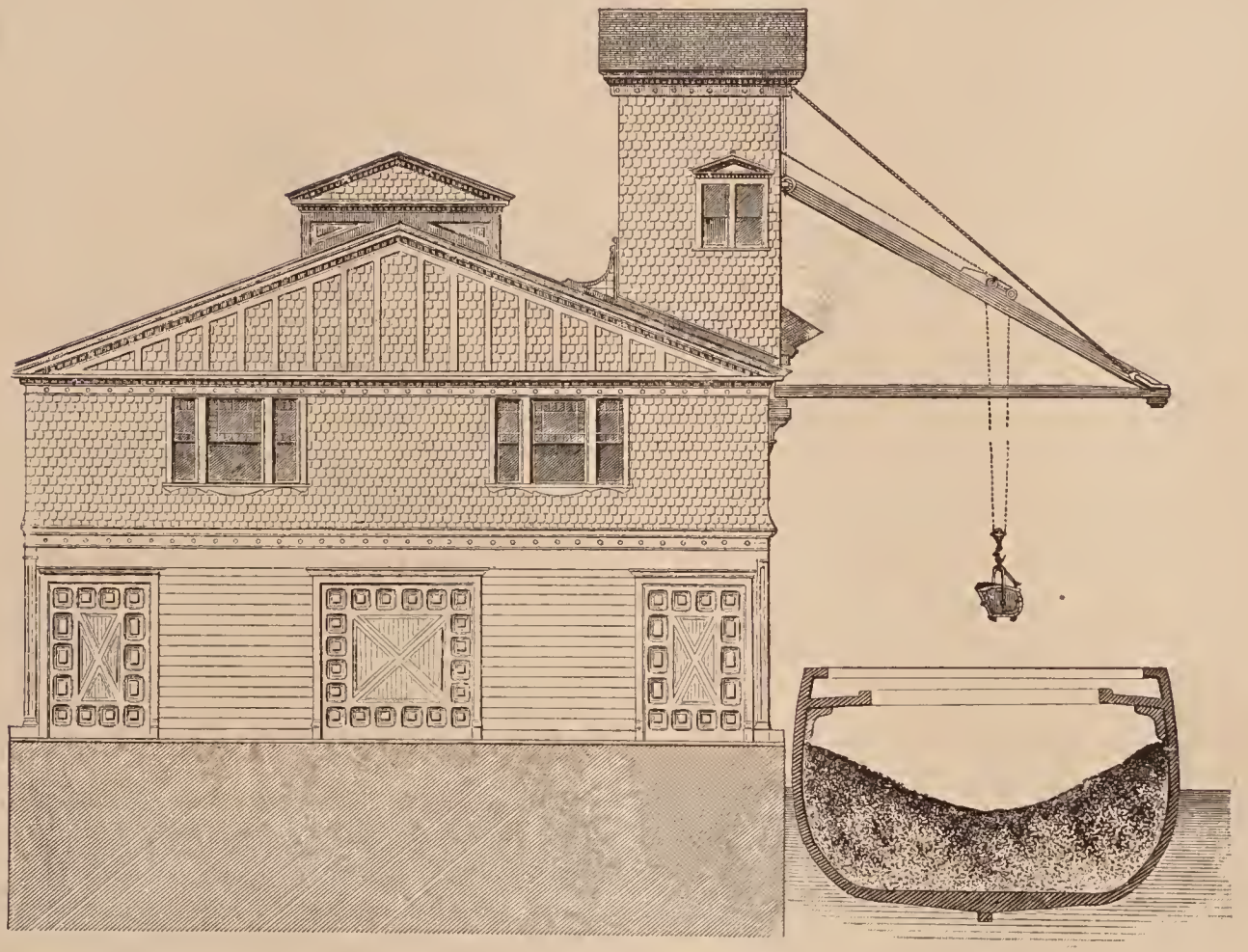
No. 96.—Lehigh Coal and Iron Co., West Superior, Wis.
No. 95.—Milwaukee Gas Light Company.

When docks have a long water front, the Elevators are set on wheels, running on a track along the water front, or on the side and top of the building. The engine is placed in the Elevator, and the whole affair moves to any part of the wharf required. In this way only as many Elevators are built as may be needed to unload at the requisite speed; yet a very long dock can be fully utilized.

No. 141.

H. G. Jordan & Co., Boston, Mass.

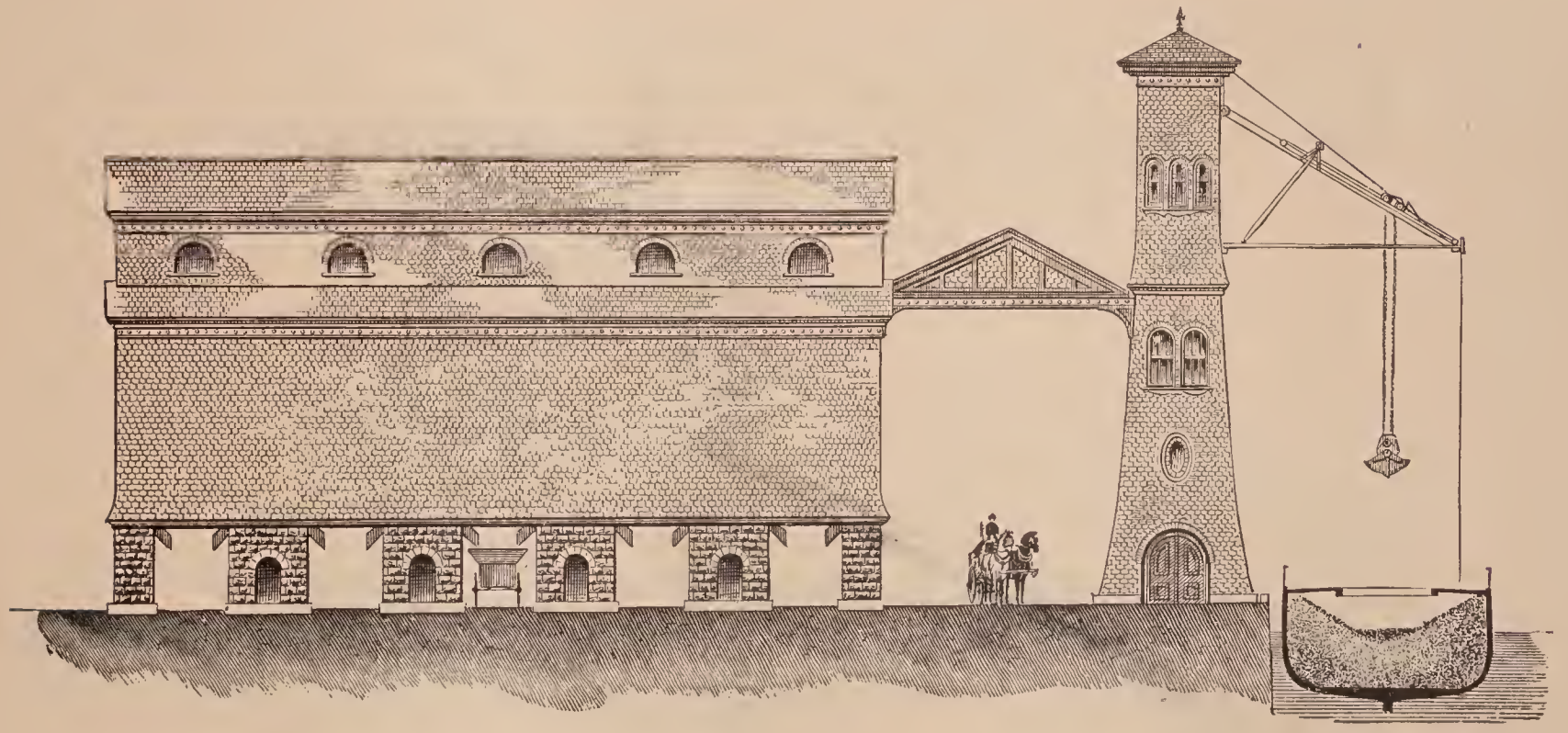
Two Steam Shovels, Movable Elevators, Automatic Railways and Coal Pockets, complete,



No. 143.

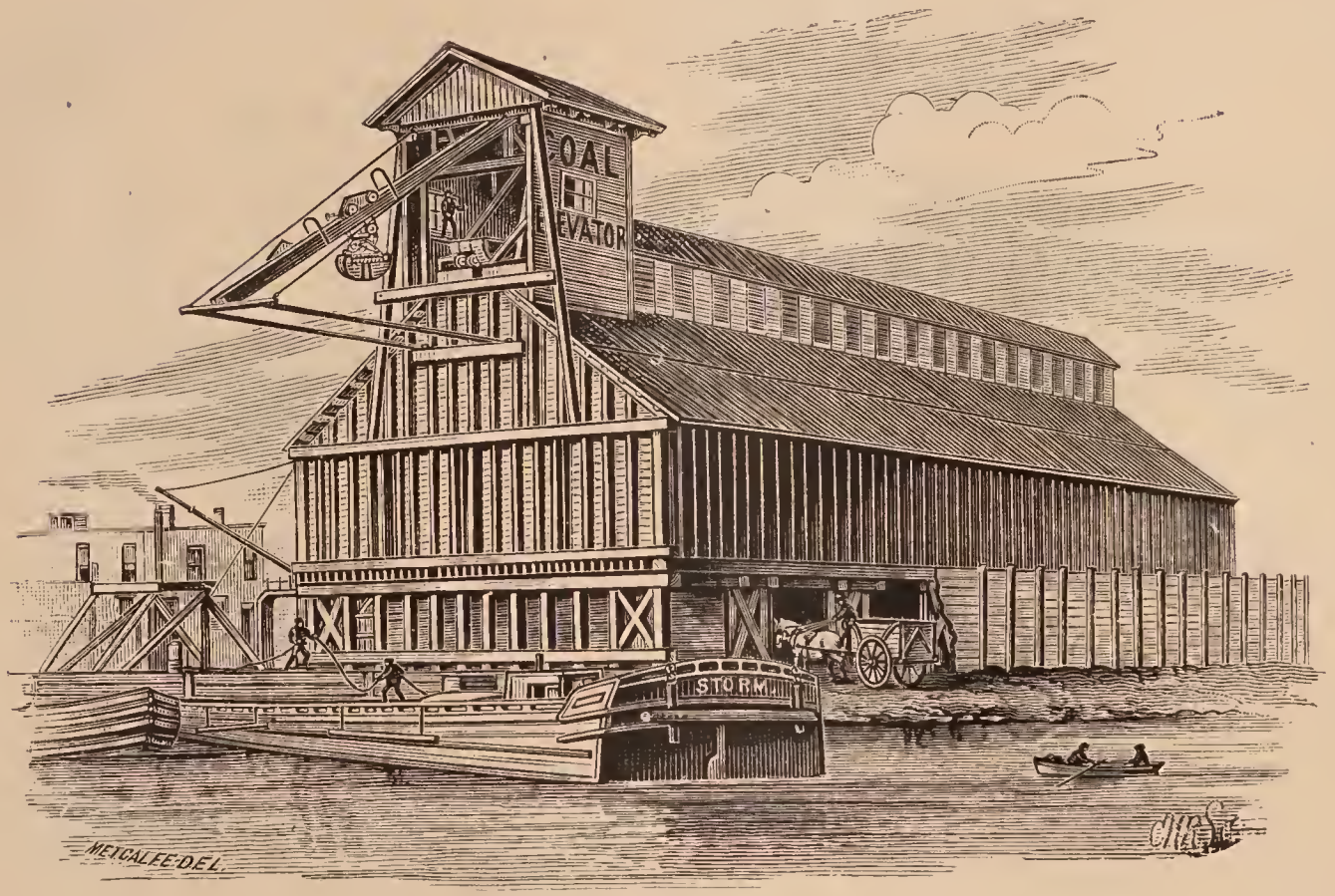
Elevator, erected on a wharf some time after the building was built and finished, to correspond with the building. Jewell Milling Co., Brooklyn, N. Y.

For description of Machinery, see the articles "Elevator."



No. 142.

Elevator, Automatic Railway, Steam-Shovel and Coal Pocket, covered and finished in an ornamental manner. The frame-work and working parts are exactly the same as though they were not covered.

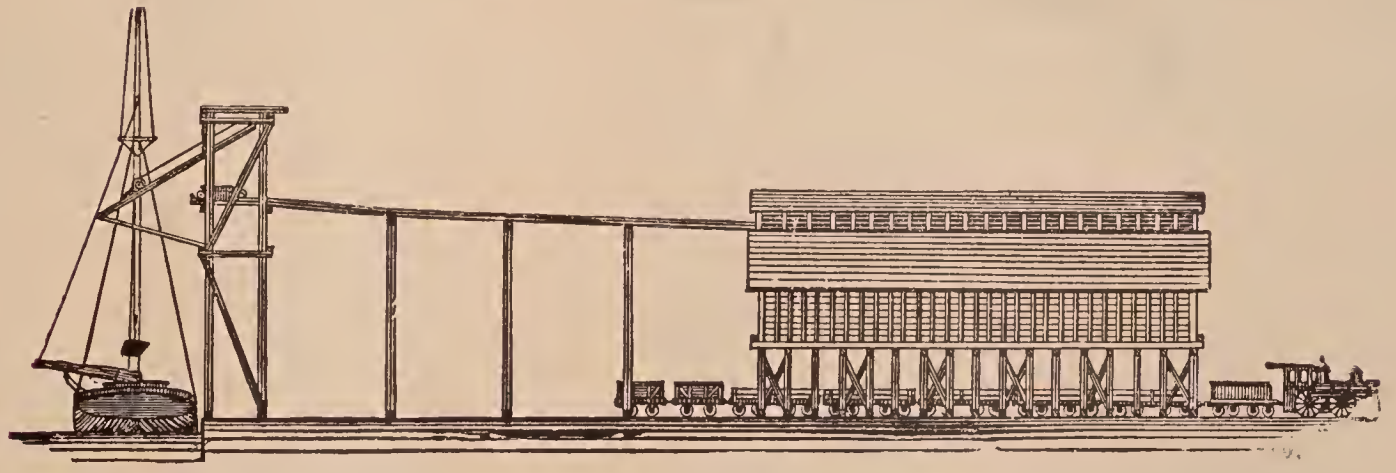


No. 1.

Steam Shovel, Automatic Railway and Elevator in a coal pocket holding 3,000 tons of coal.

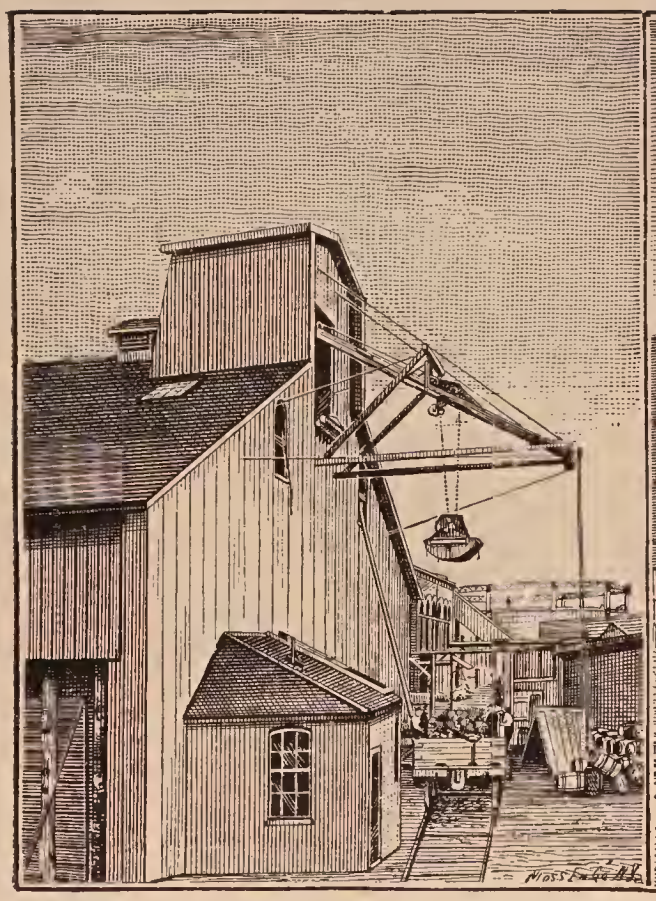
No. 128.

No. 27

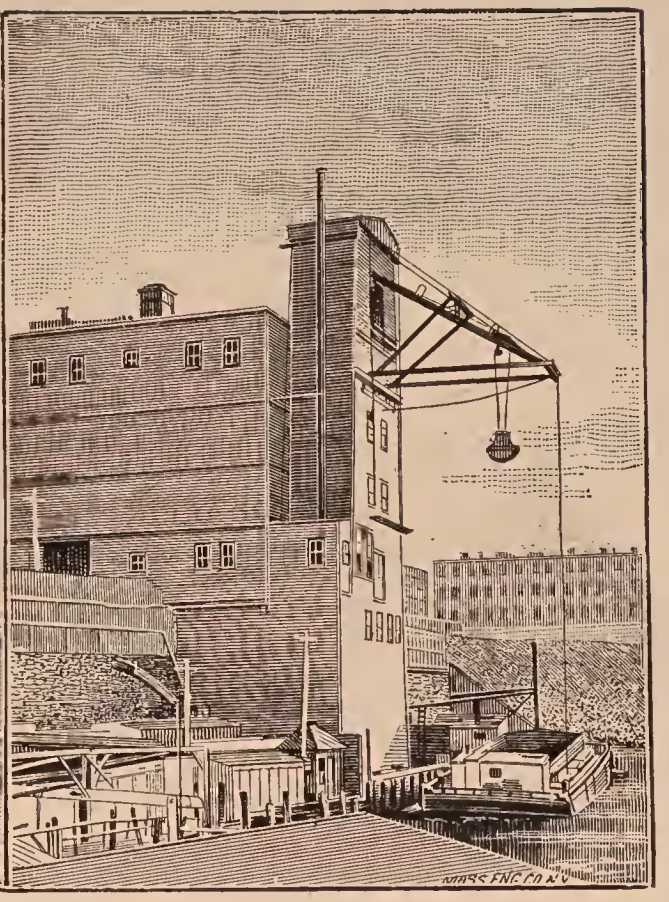


No. 128.—Automatic machinery, with bridge 300 feet span, especially adapted to iron ore handling. Elevator and bridge movable along the entire length of the wharf.

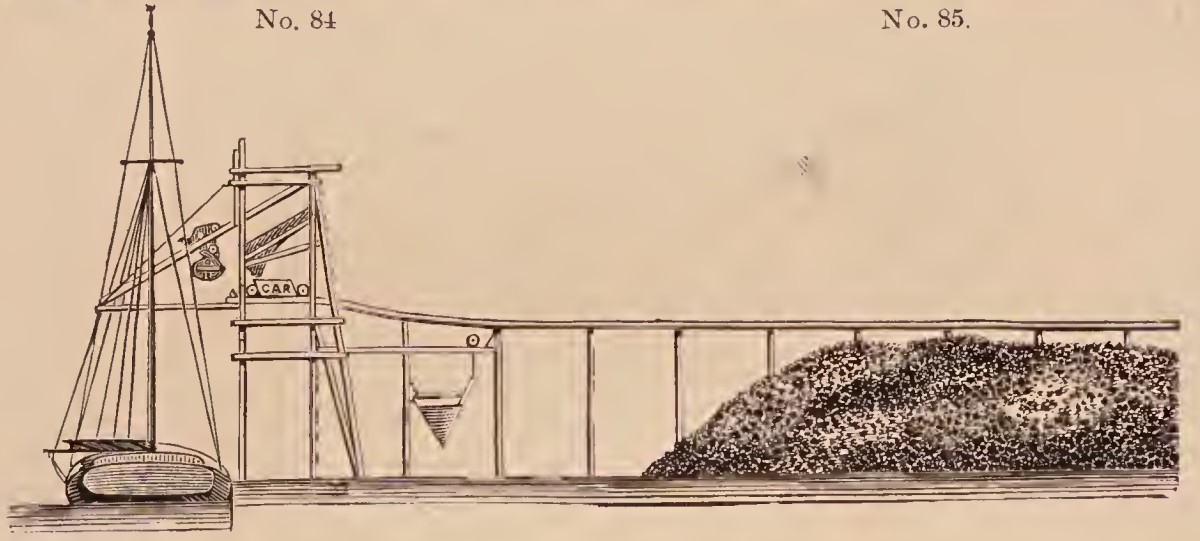
No. 27.—Elevator and Coal Pocket, as built by the Willard Asylum, Willard, N. Y. It costs no more to store the coal in the building than it would if it was on the front of the wharf.



No. 84



No. 85.

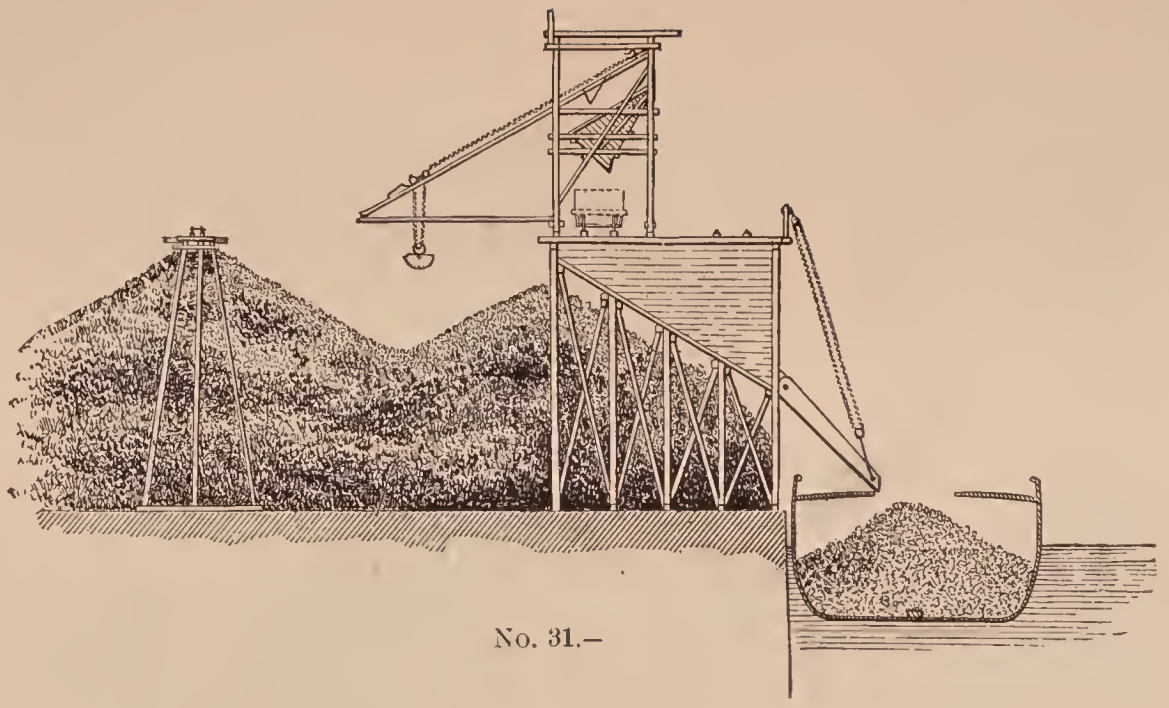


No. 2.

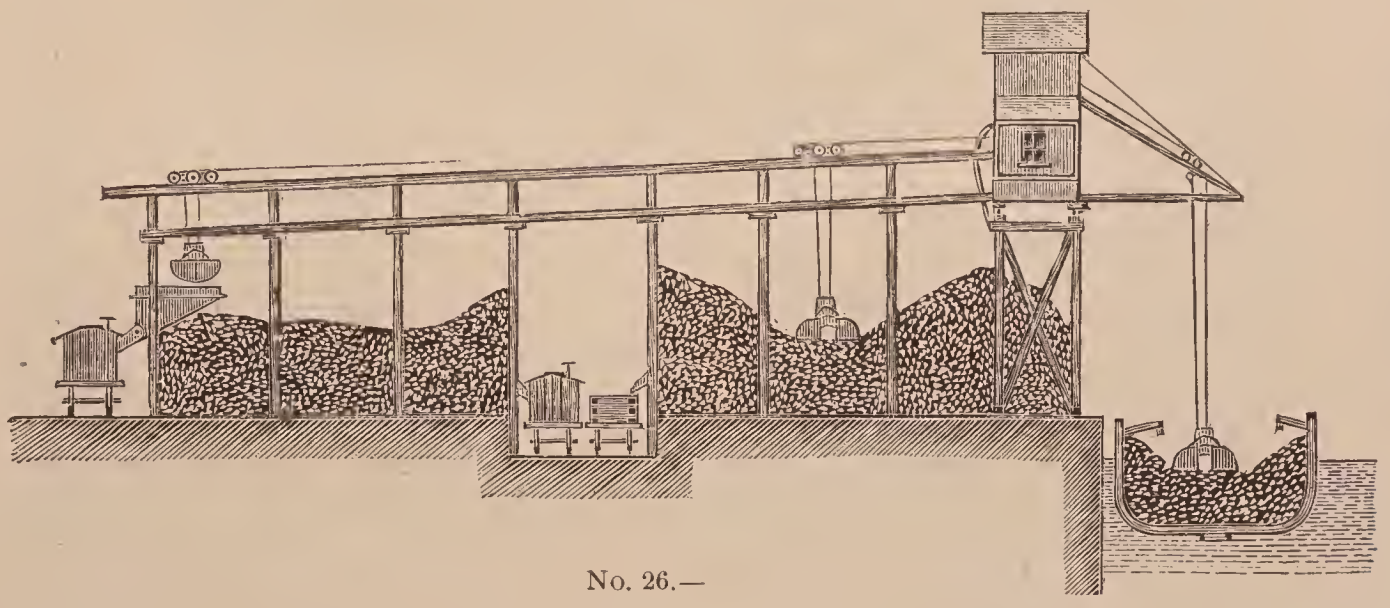
No. 84,—Toronto Gas Light Co. Automatic Railway and Elevator.

No. 85.—Curtis & Blaisdell. Coal Pockets, Automatic Railway and Elevator. The coal is hoisted 90 feet high.

No. 2.—Elements of Elevator and Automatic Railway.



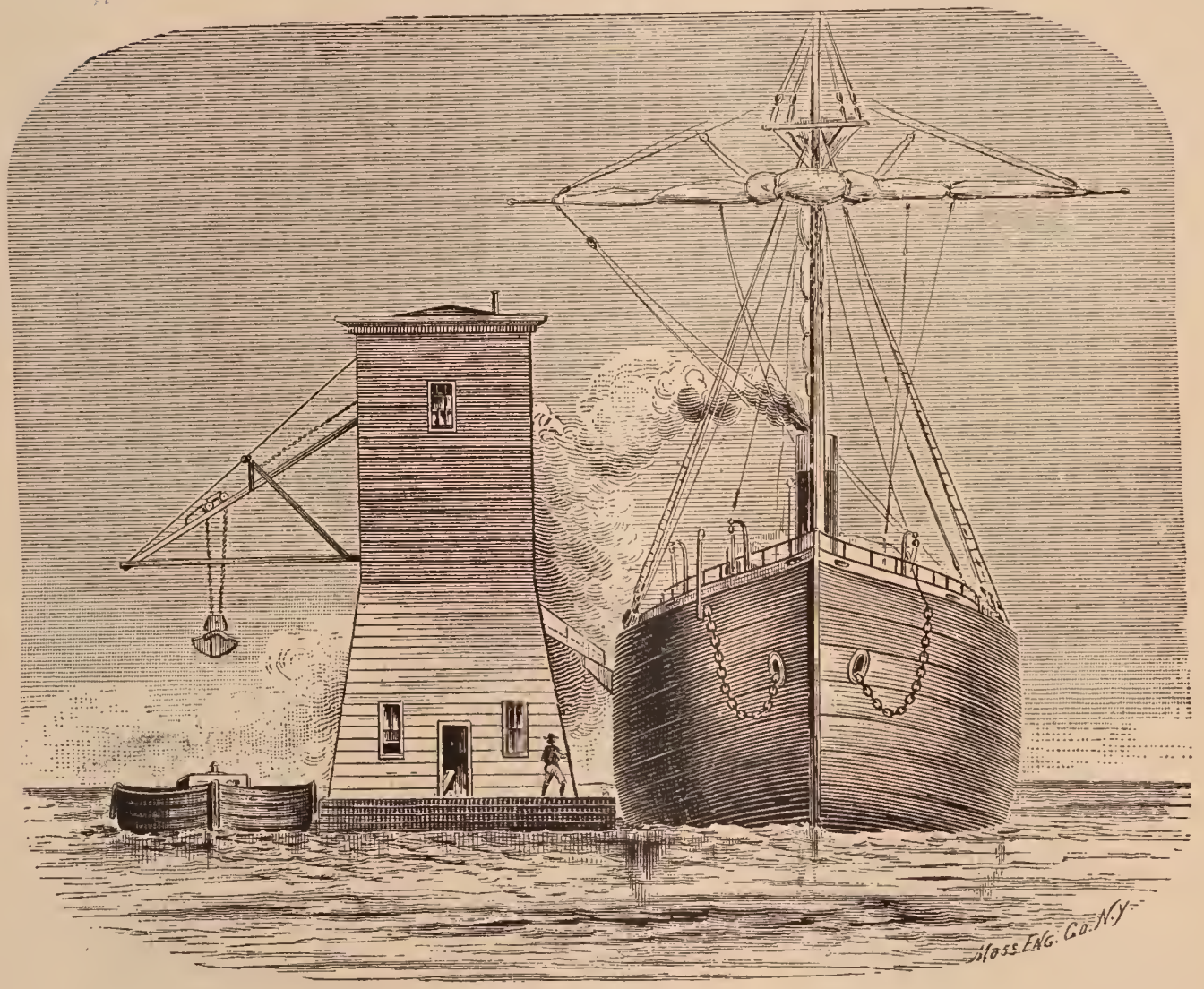
No. 31.—



No. 26.—

No. 31 Arrangement for taking coal from stock-pile and loading into cars or vessels.

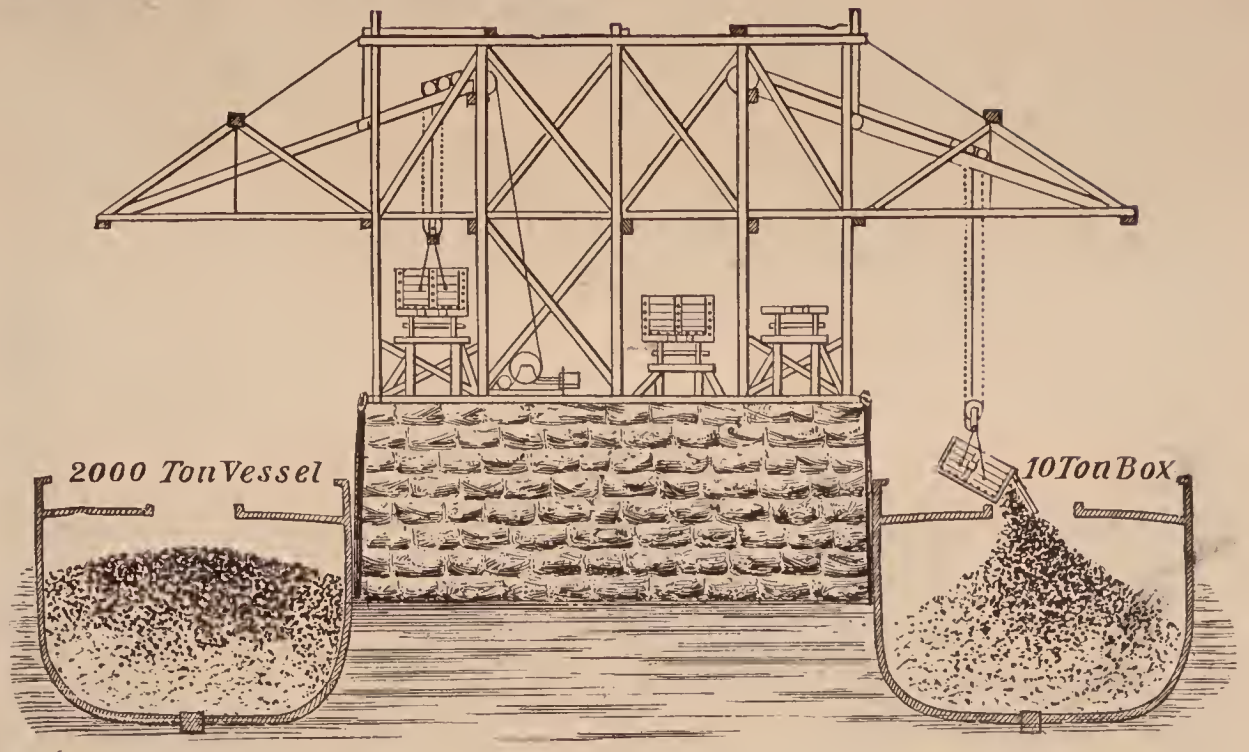
No. 26. Arrangement for unloading a vessel, and also for picking up from stock-pile and loading into cars.



No. 83.

Steam-Shovel and Elevator, arranged for taking coal from a barge and spouting it to steamship.

HUNT'S SPECIAL ELEVATOR FOR LOADING VESSELS.



No. 1110.

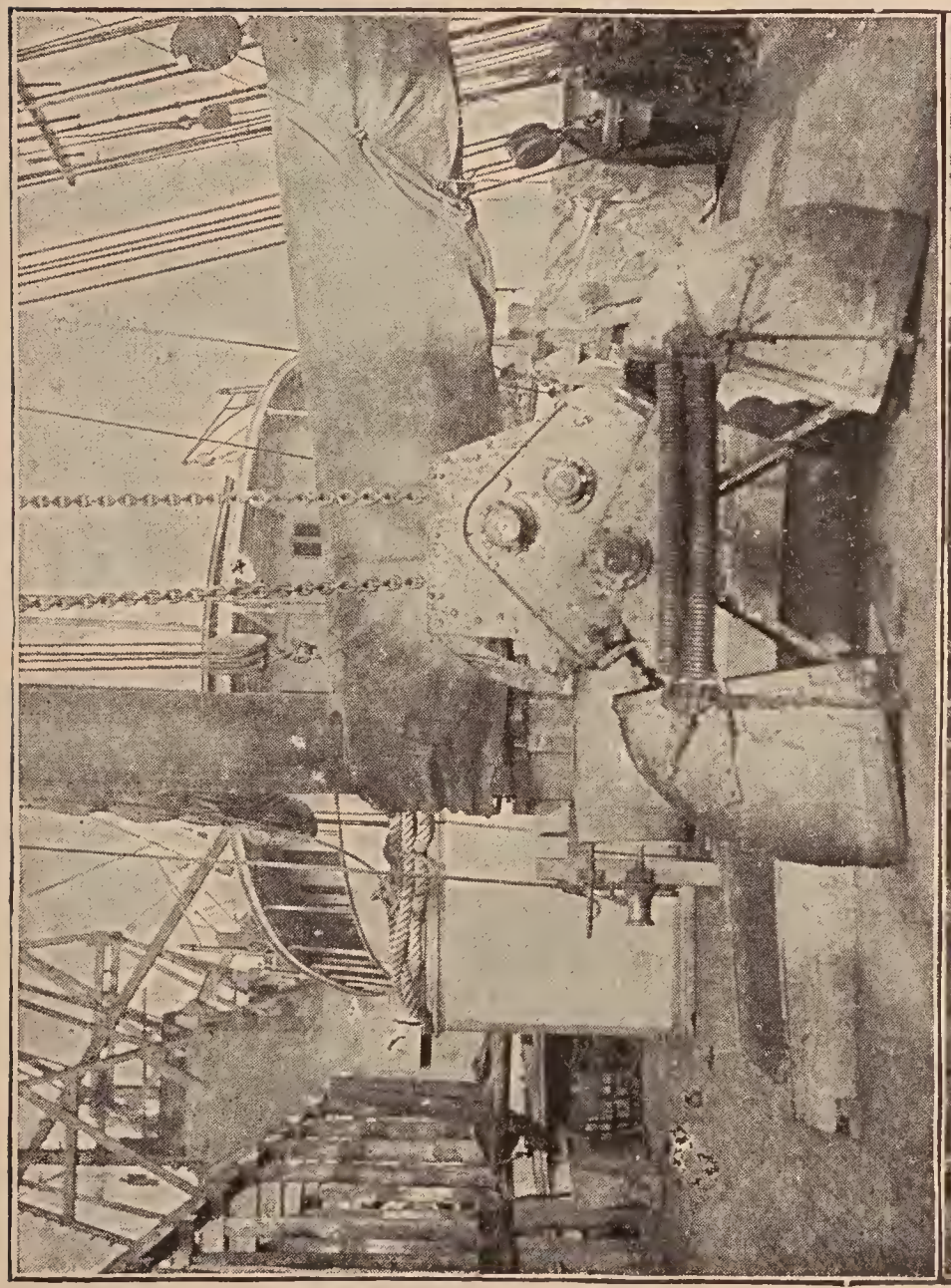
This is the most powerful wharf machinery in the country, handling 16 ton boxes or cars as easily, and almost as rapidly, as our ordinary elevators handle one ton tubs. It greatly lessens the breakage of coal in shipping

The coal is carried from the mines to the shipping port in square boxes 8½ feet wide, 9½ feet long and 5 feet deep, holding ten tons of coal each. Two of these boxes are carried on an ordinary flat car. The cars are run under the elevator, the ten ton boxes are hoisted to the booms, lowered down to the hatch of the vessel, dumped, then hoisted and replaced on the car. It takes from three to five minutes to make a round trip. The boxes are of the plainest description, and cost but little more than the sides on an ordinary gondola car. They can be set aside, and the car used for general traffic purposes when needed In shipping coal to port and loading iron ore for the return trip, they would be as easy to unload with men as ordinary cars, and by erecting a fixed transfer elevator, the ore could be piled very high and unusually close to the furnace, dispensing with the elevated trestle now used for storage purposes The labor expense as well as the number of men

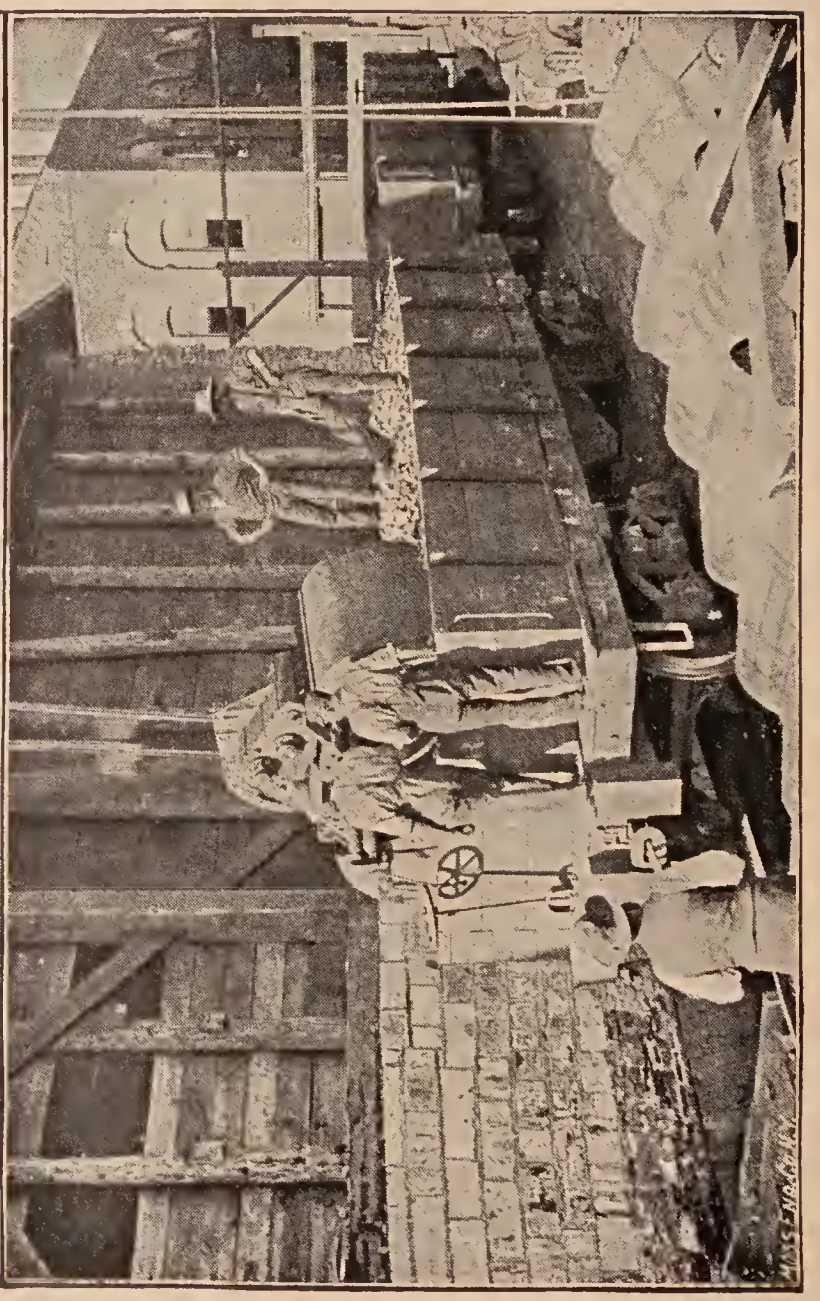
This is a special machine and built only to order. We are prepared to build still larger sizes, capable of taking Gondola 20 ton cars and dumping into a vessel in the same way.

We furnish all the iron-work and the detailed plans for the timber-work.

These elevators can be made movable on the front of the wharf if desired.



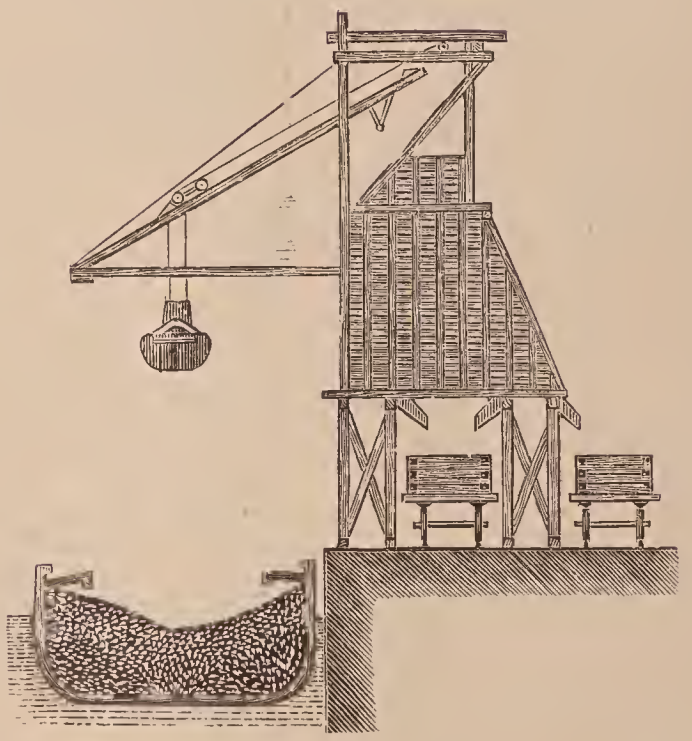
No. 98.—Steam shovel on the deck of a coal vessel.



No. 97.—Steam shovel taking coal from cars.

HUNT ELEVATOR FOR SPECIAL WORK.

No. 84.

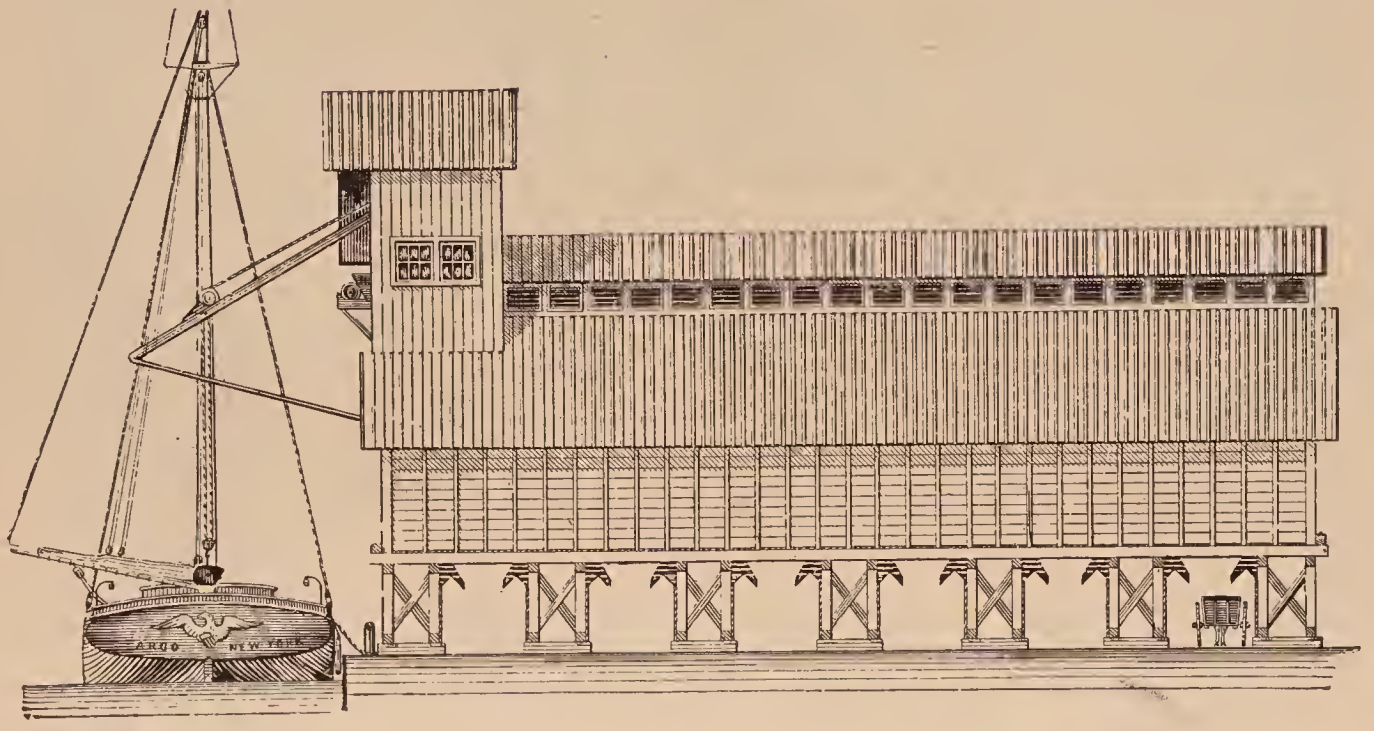


No. 8.

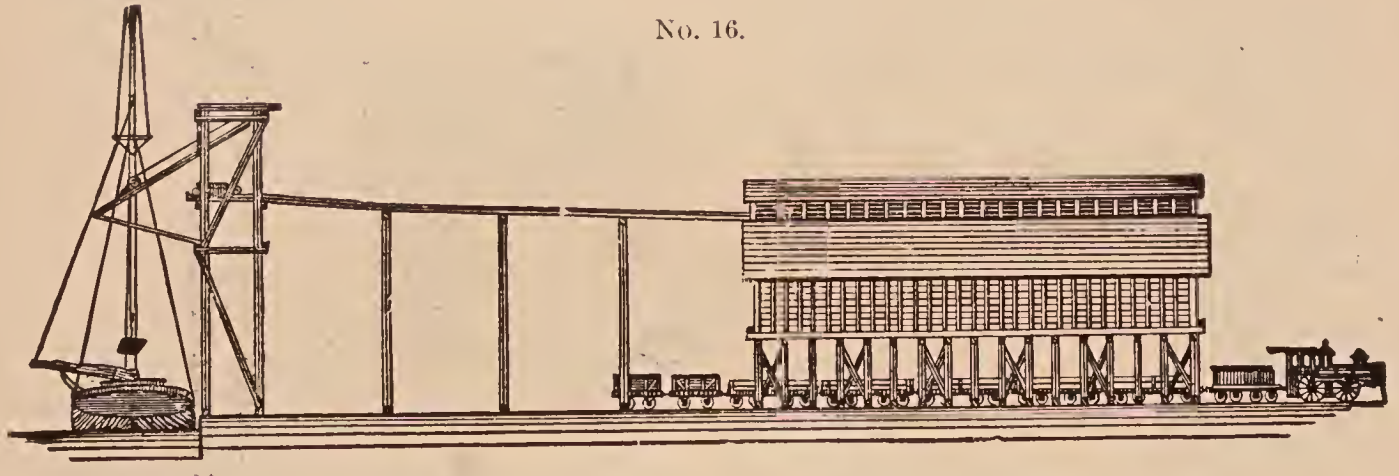
No. 84.—Toronto Gas Light Co. Unloading cars with Steam Shovel and storing the coal in a building with Automatic railway

No. 8.—Naugatuck Railroad, Bridgeport, Conn, Loading cars from a vessel.

COAL POCKETS.



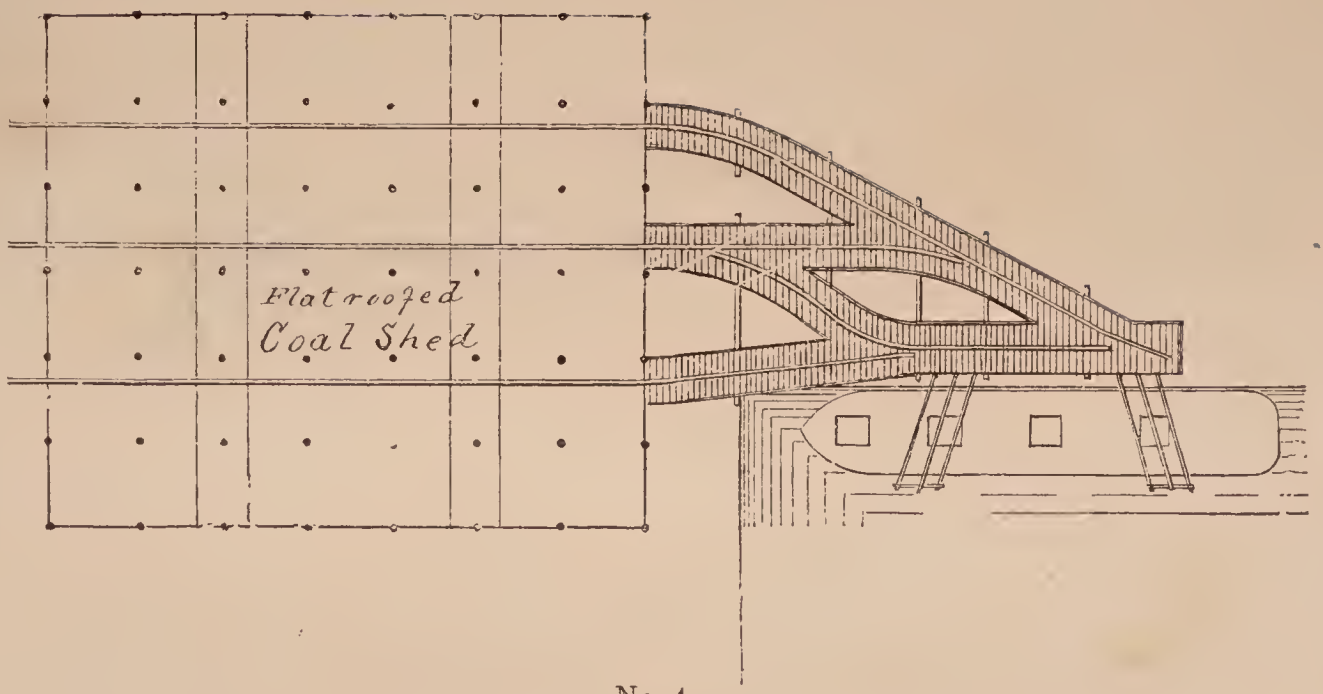
No. 16.



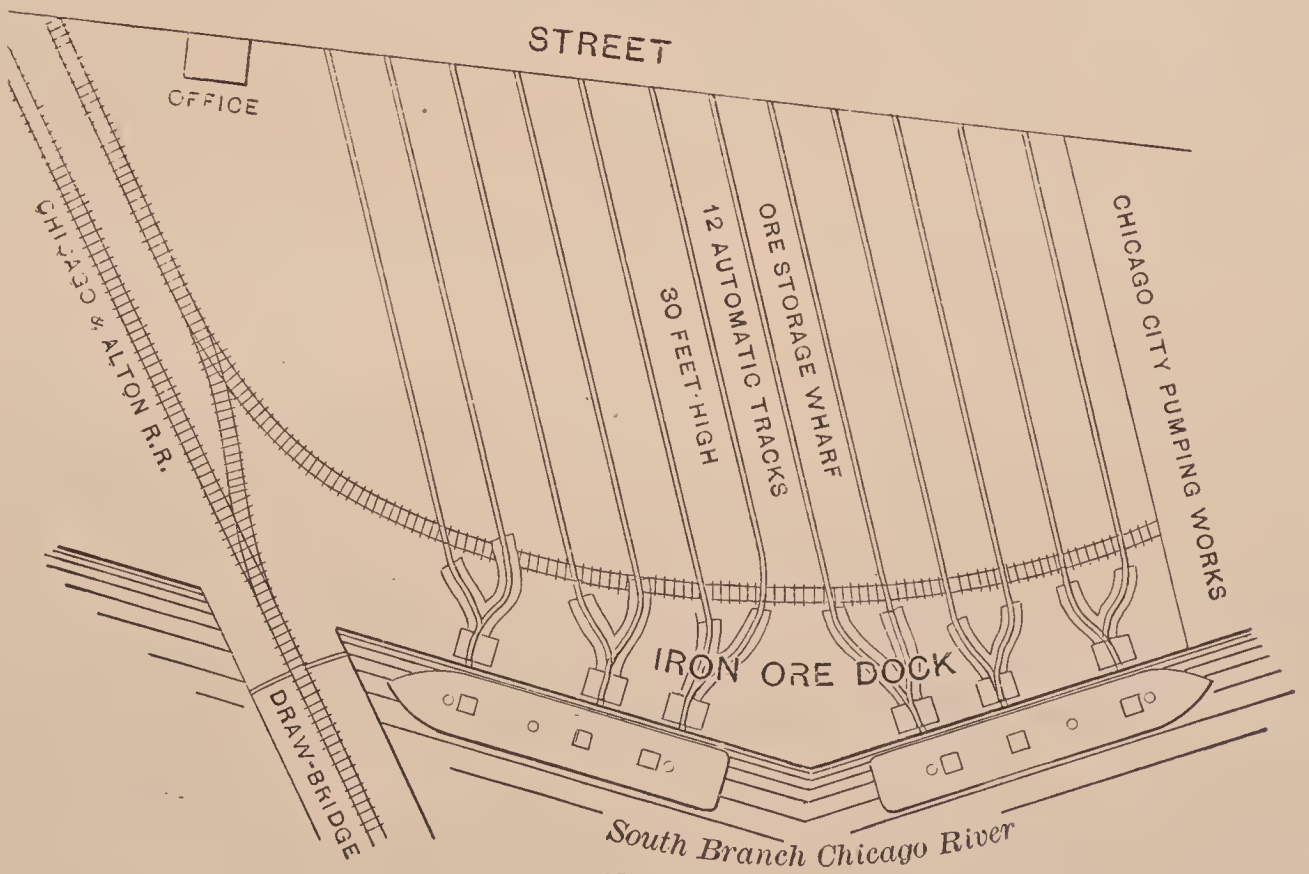
No. 27.

No. 16. C. H Reynods Son & Co Brooklyn N. Y. Capacity 3000 tons.

No. 27 Elevator and Coal Pocket, as built by the Willard Asylum, Willard, N. Y. It cost no more to store the coal in the building than it would if it was on the front of the wharf.



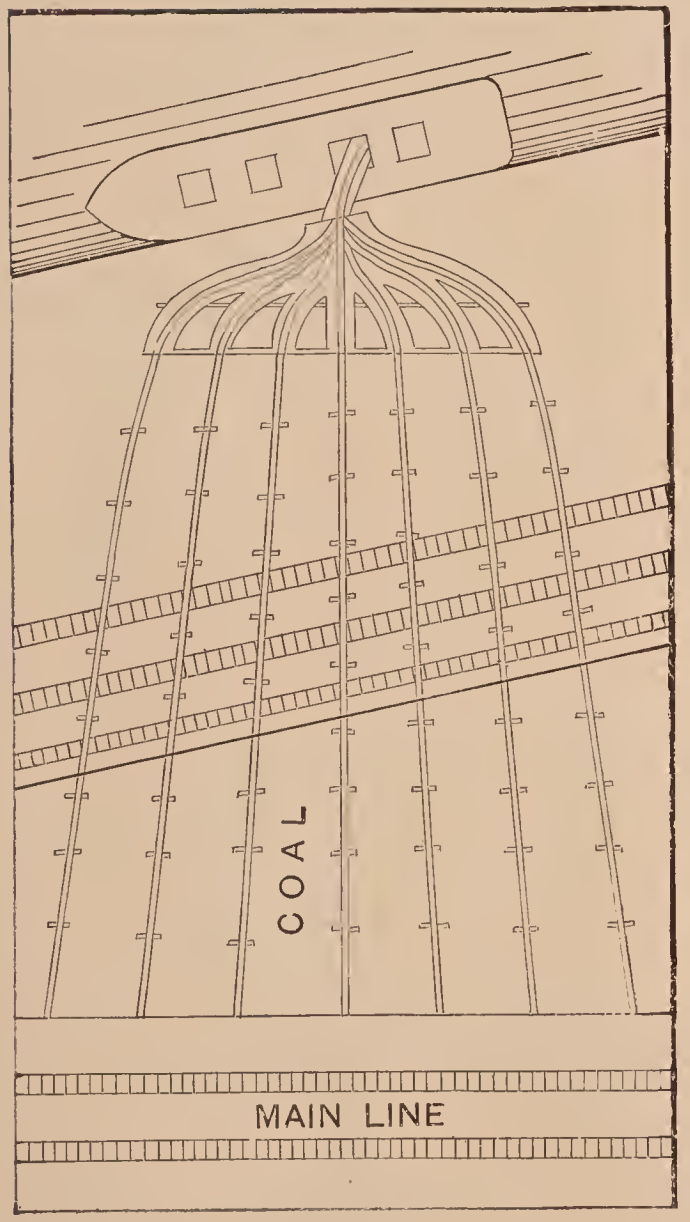
No. 4.

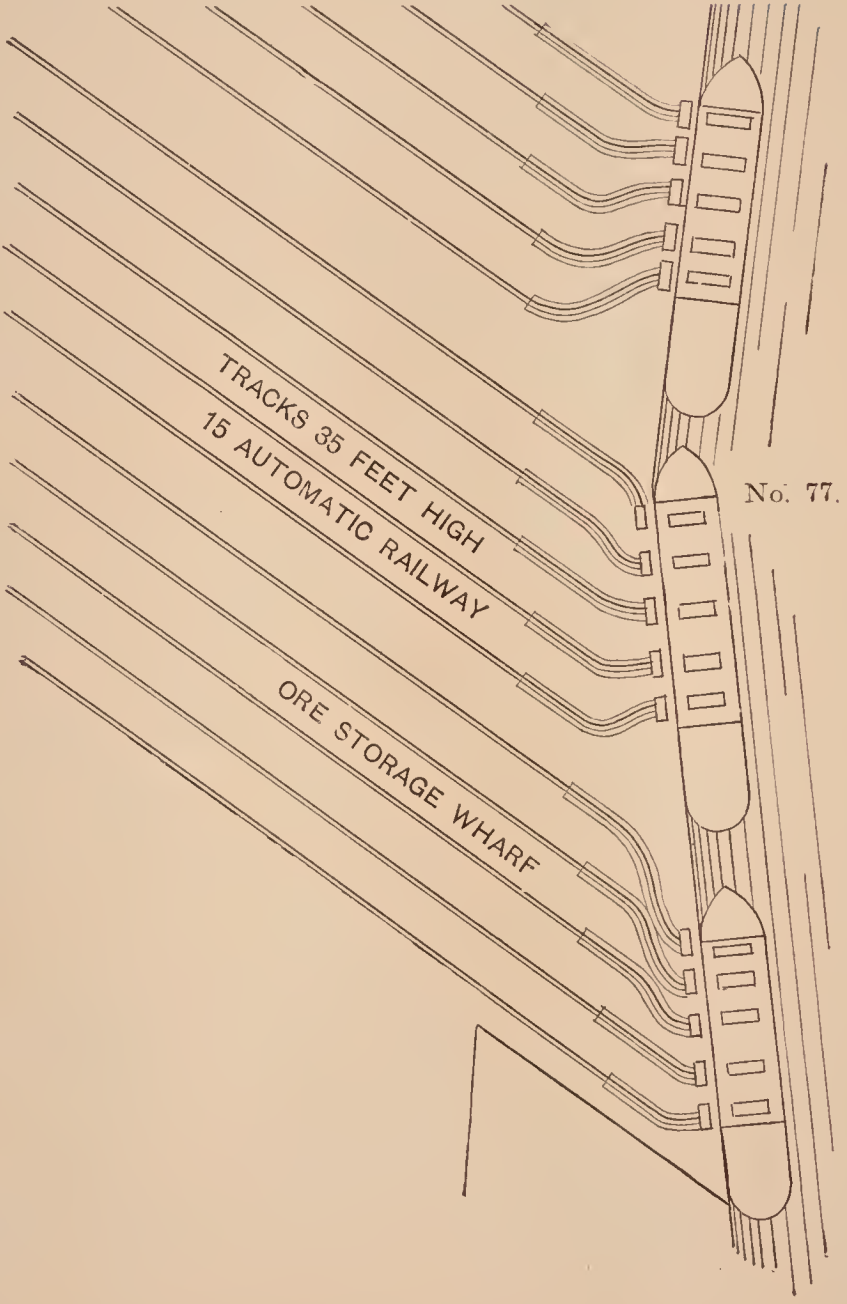


No. 76.

No. 4. Plan of Automatic Railway Tracks. S. Tuttle's Son & Co., Brooklyn, N. Y
No. 76. Twelve Automatic Tracks, Joliet Steel Co., Chicago, Ill.

No. 73.



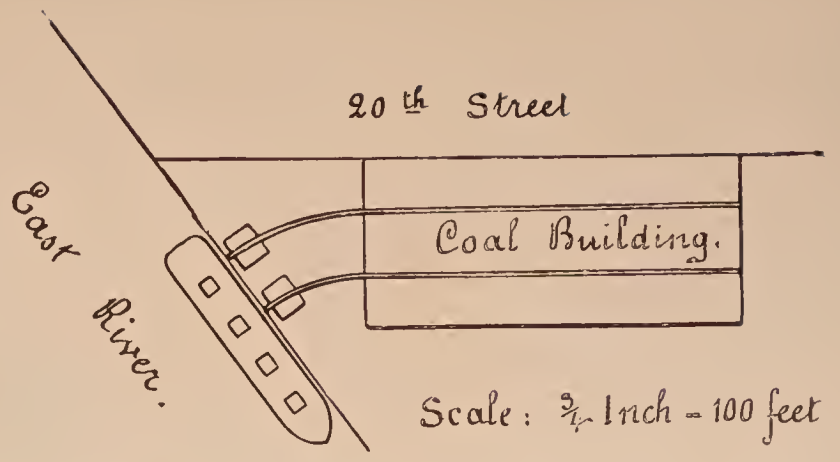


No. 77.

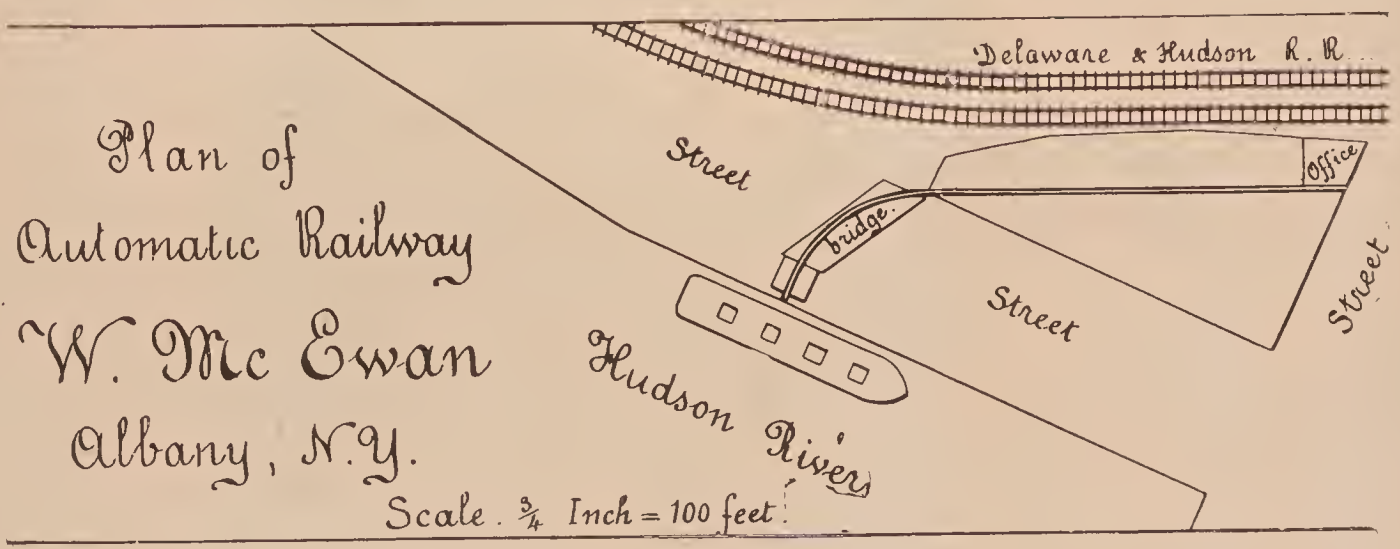
No. 73.—Elevator with seven Automatic Tracks N. Y., N. H. & H. R. R. Co., New Haven, Conn.
No. 77.—Fifteen Automatic Tracks, Union Steel Co., Chicago.

The automatic railway can have almost any curvature in the track at the loading end
The above cuts show arrangements to suit particular wharves.

Plan of
Automatic Railway.
New-York
Gas Light Co.,
New-York, N.Y.

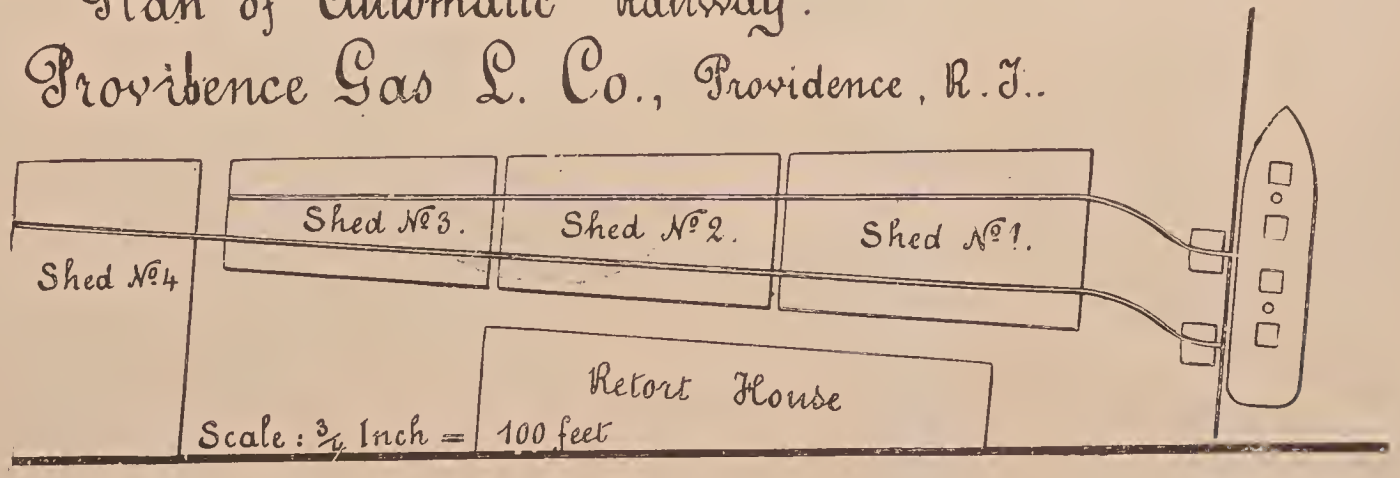


No. 57.

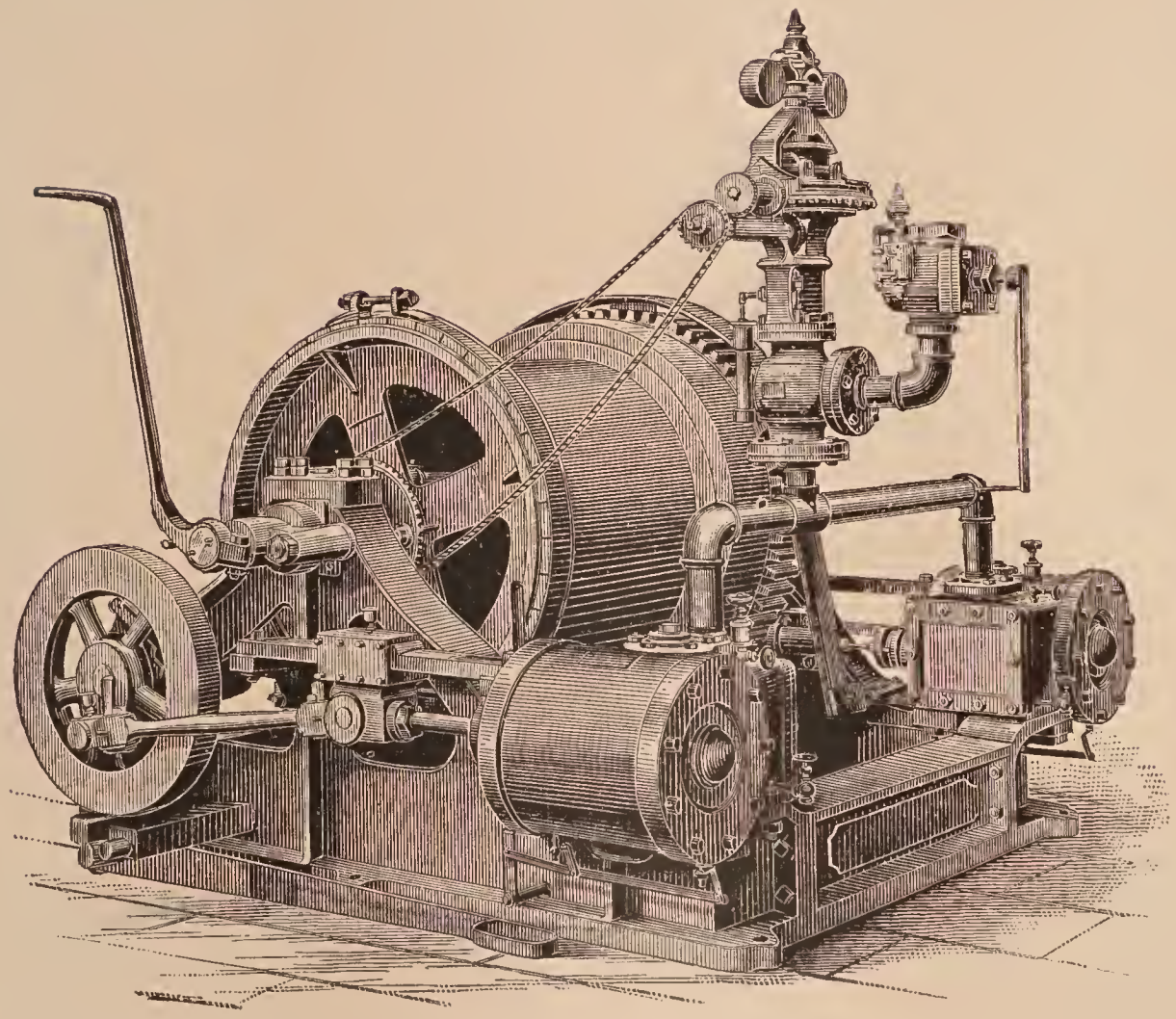


No. 55.

Plan of Automatic Railway.
Providence Gas L. Co., Providence, R.I..



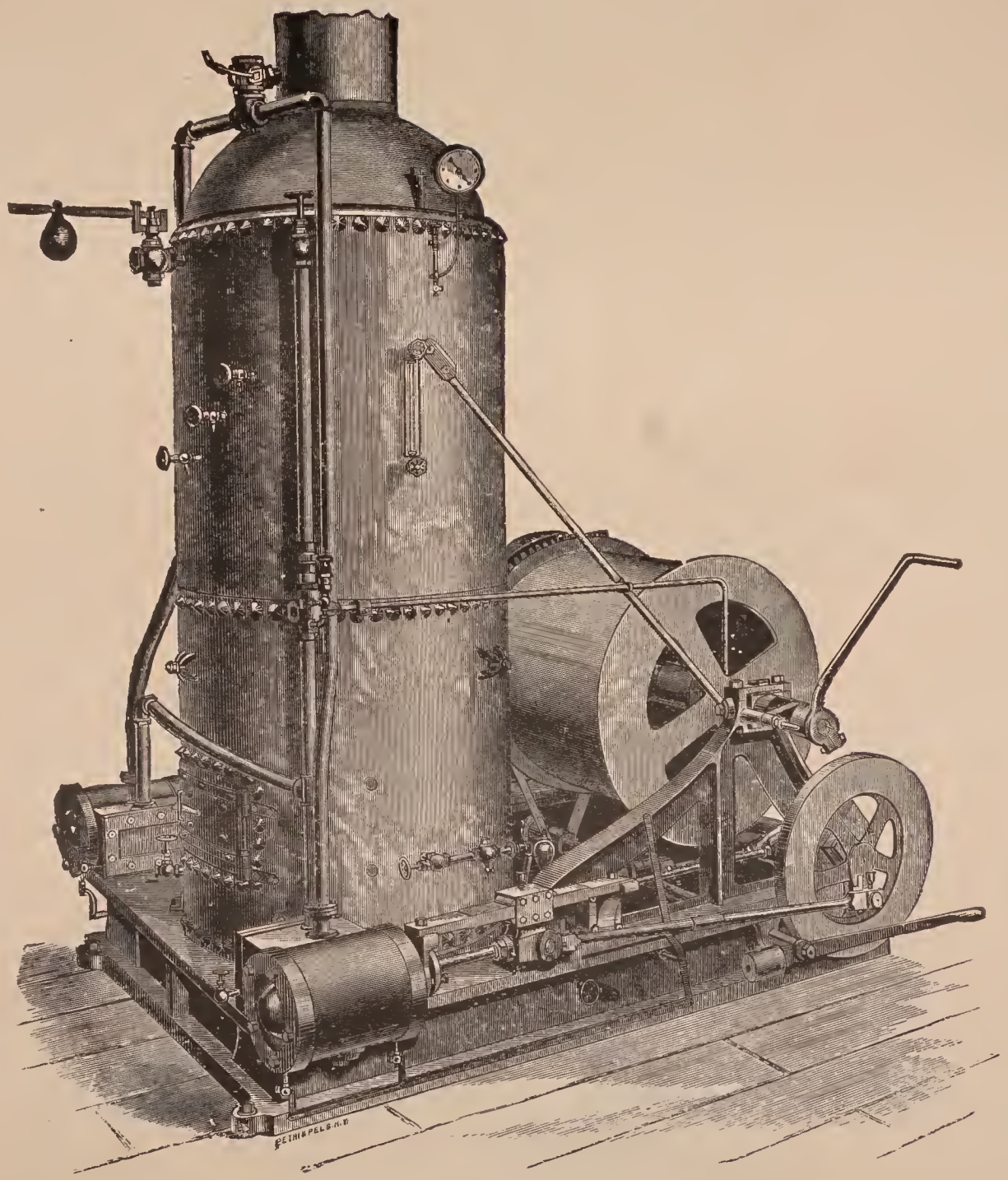
No. 54



No. 1127.

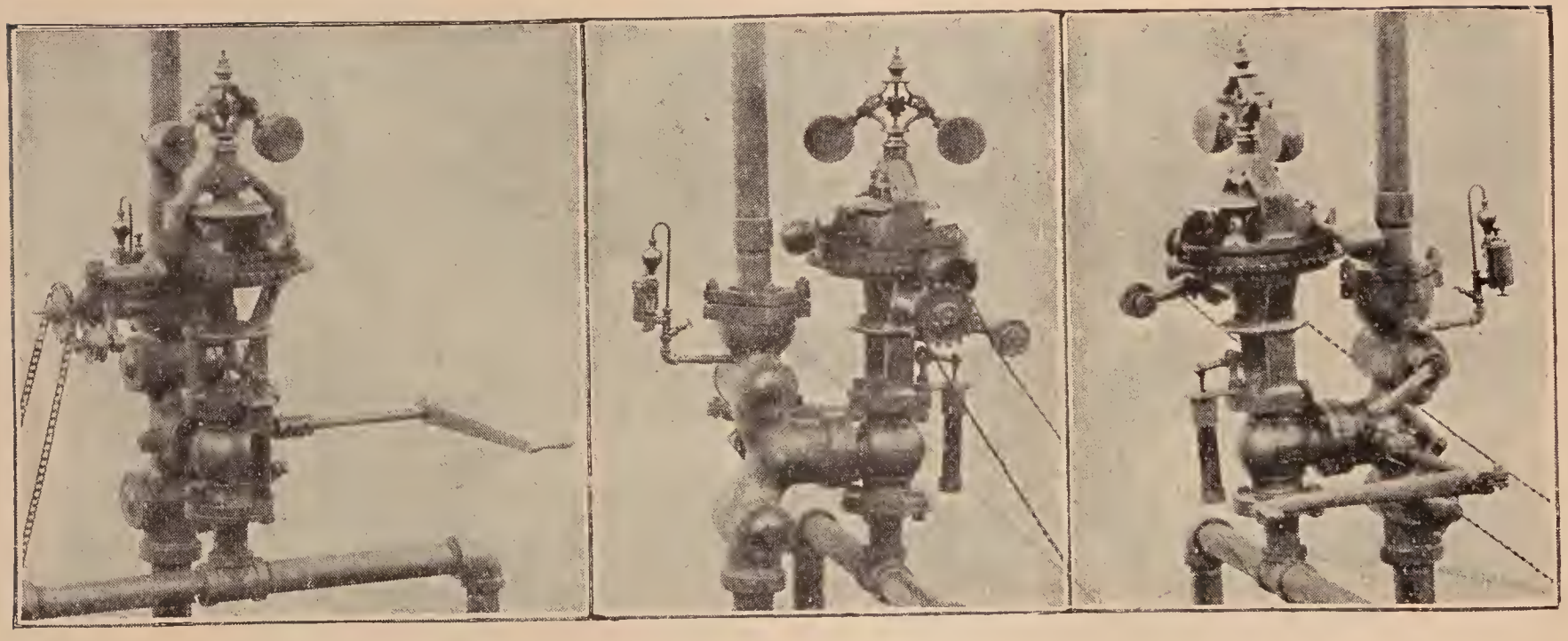
Hunt Hoisting Engine for Steam-Shovel.

For description see article on "Hoisting Engines."



No. 1001

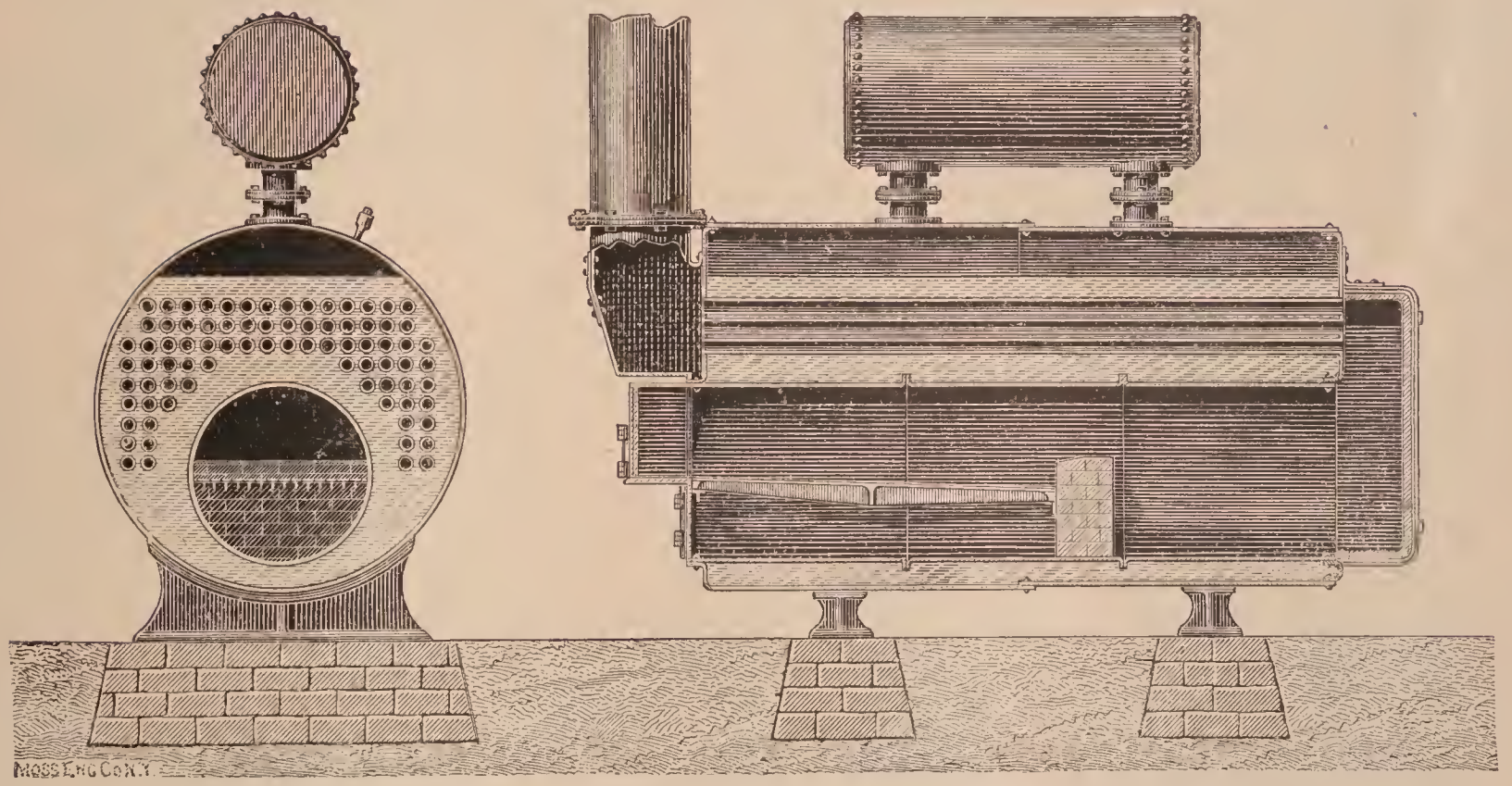
Hunt Rapid Hoisting Engine with Boiler on the same bed plate.
For description, see article on "Hoisting Engines."



No. 1135. No. 1133. No. 1134.

Hunt Governor for automatically changing the speed of engine in coal hoisting.

For description see article on Hoisting Engines.

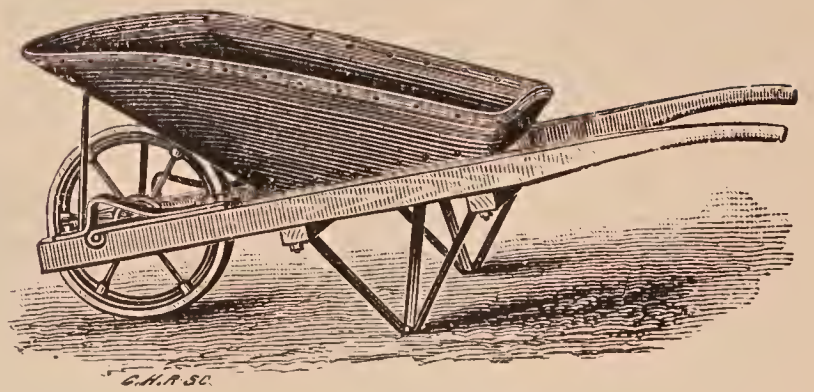


No. 1159.

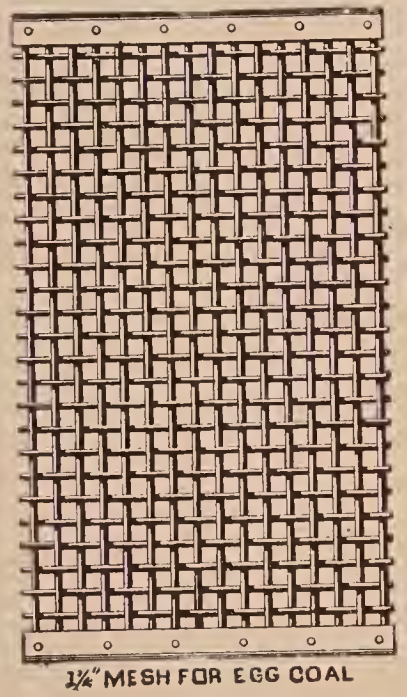
Stationary Boiler without brick setting.

This is a modification of the Scotch Marine Boiler that is in almost universal use on steamships. It is one of the strongest forms—every part can be reached inside or outside and makes steam readily

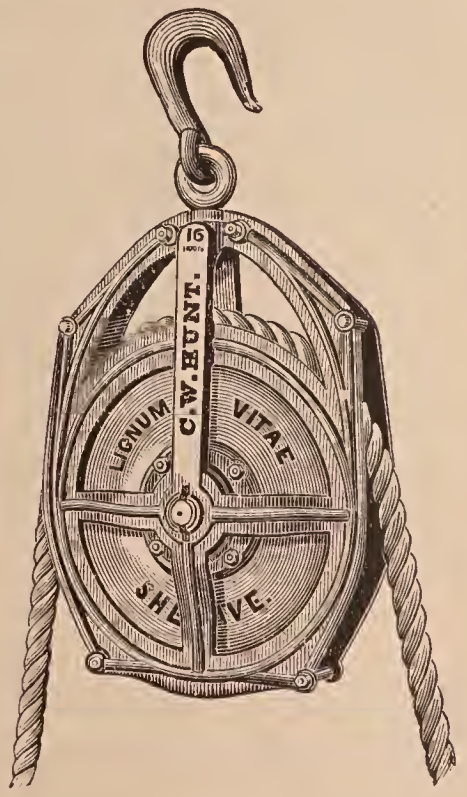
No. 1028
Manila Rope



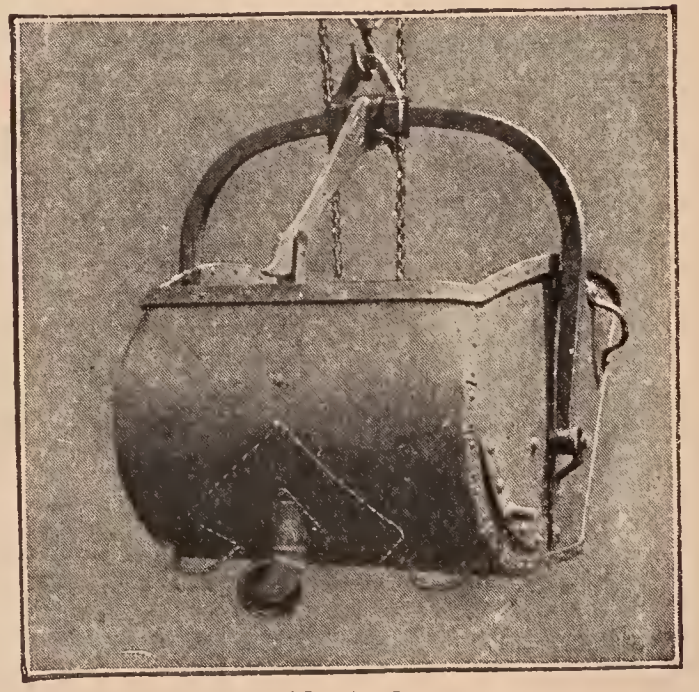
No. 1029
Wheelbarrow.



No. 151.
Coal Screens



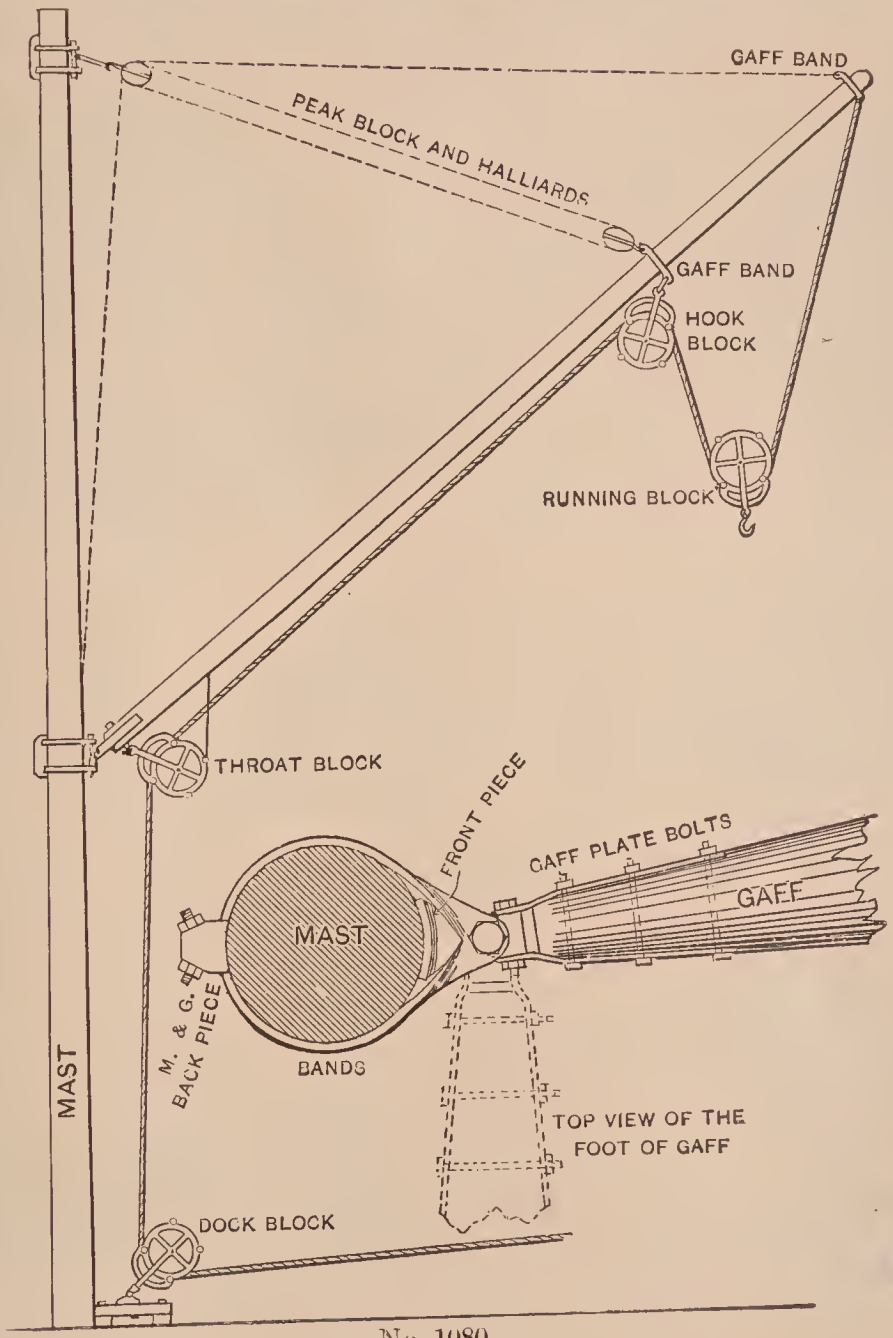
No. 1015.
Hoisting Blocks.



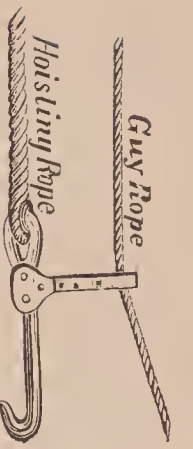
No. 1147.
Steel Coal Tubs.

We print a special catalogue describing the above articles.

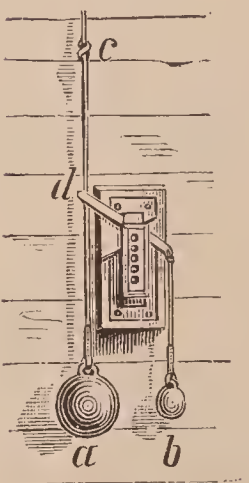
No. 1011.
Wire Rope.



No. 1080
Mast and Gaff.



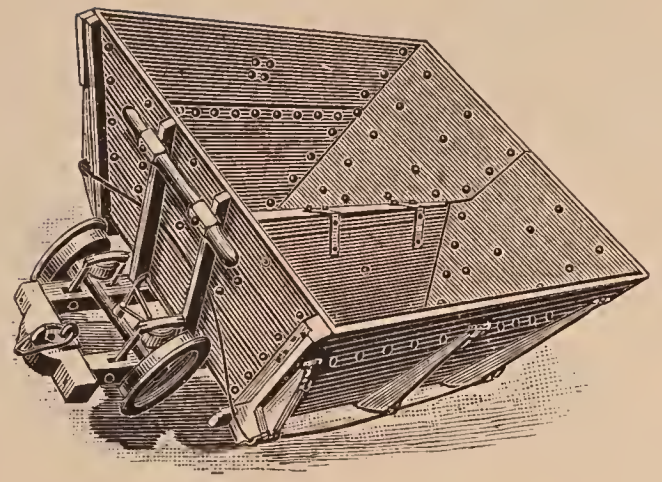
No. 1004
Tub Hooks for Coal Hoisting



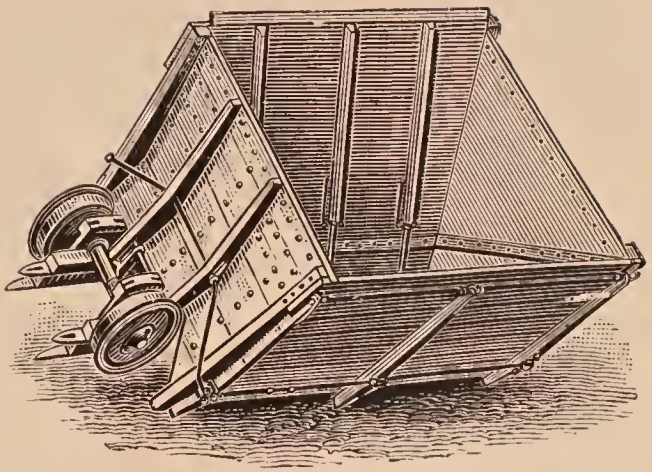
No 1014
Counting Register.

No. 1054.
Crane Chain.

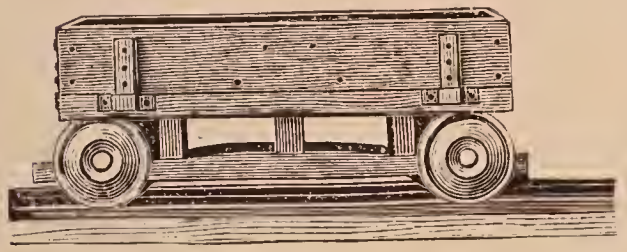
We print a special catalogue describing the above articles.



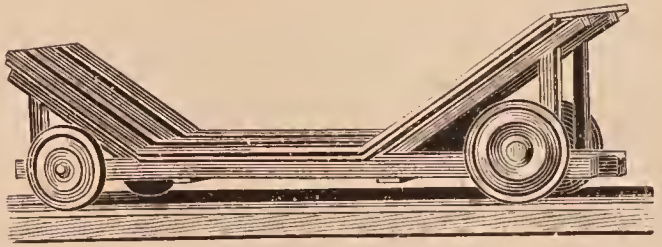
No. 1032



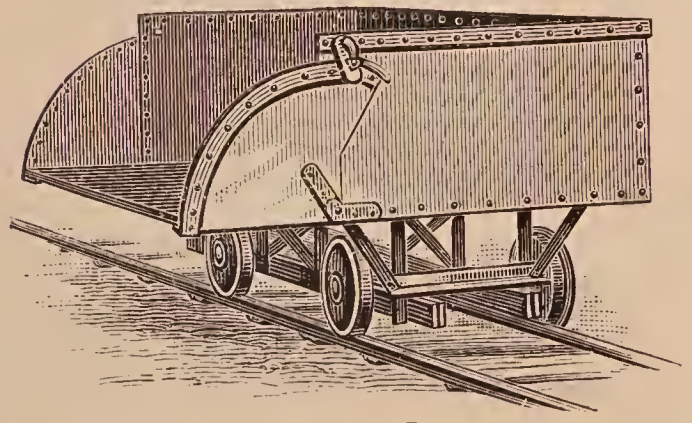
No. 1016.



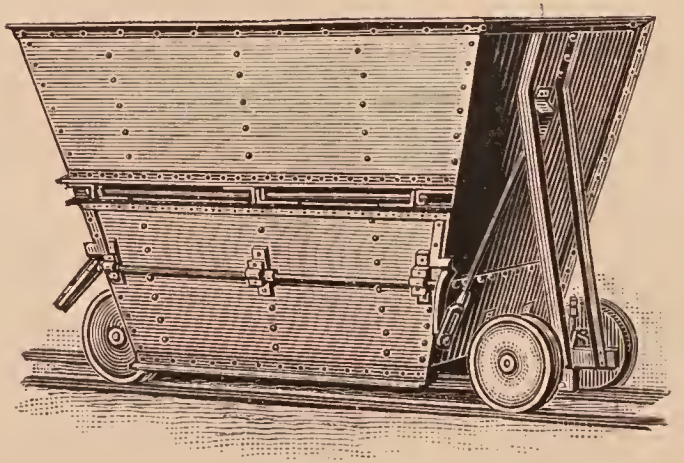
No. 1026.



No. 1034.



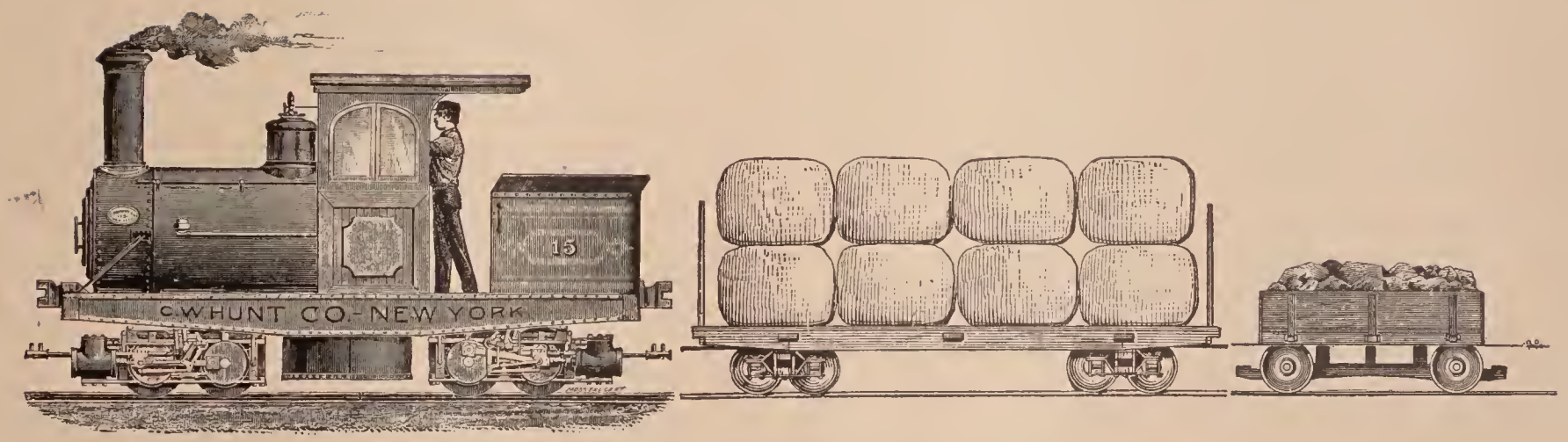
No. 1017.



No. 1031.

Narrow Gauge Railways

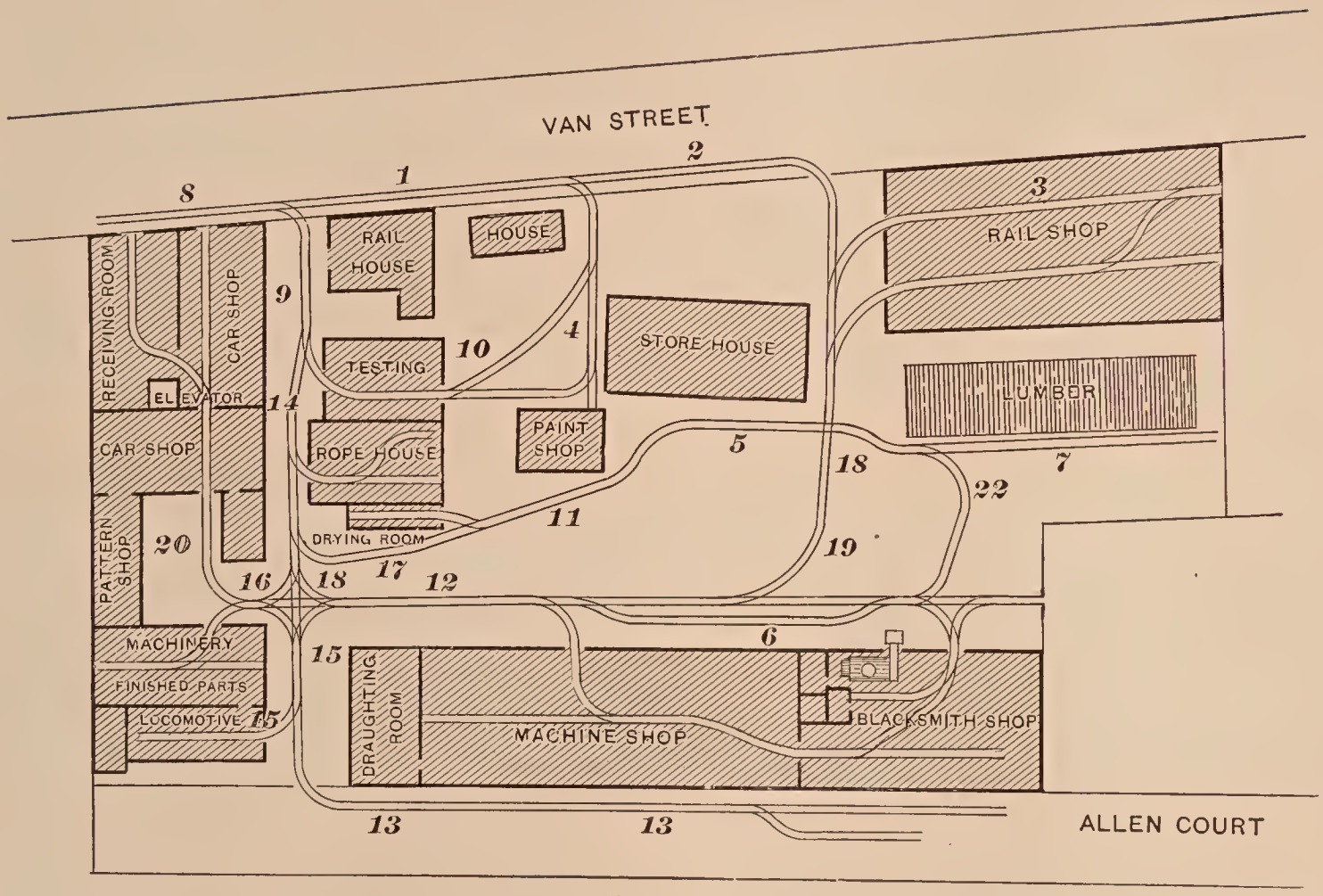
For Special Cars, see our catalogue on "Industrial Railways."



No. 1178. No. 1073. No. 1086.

Narrow Gauge Railways.

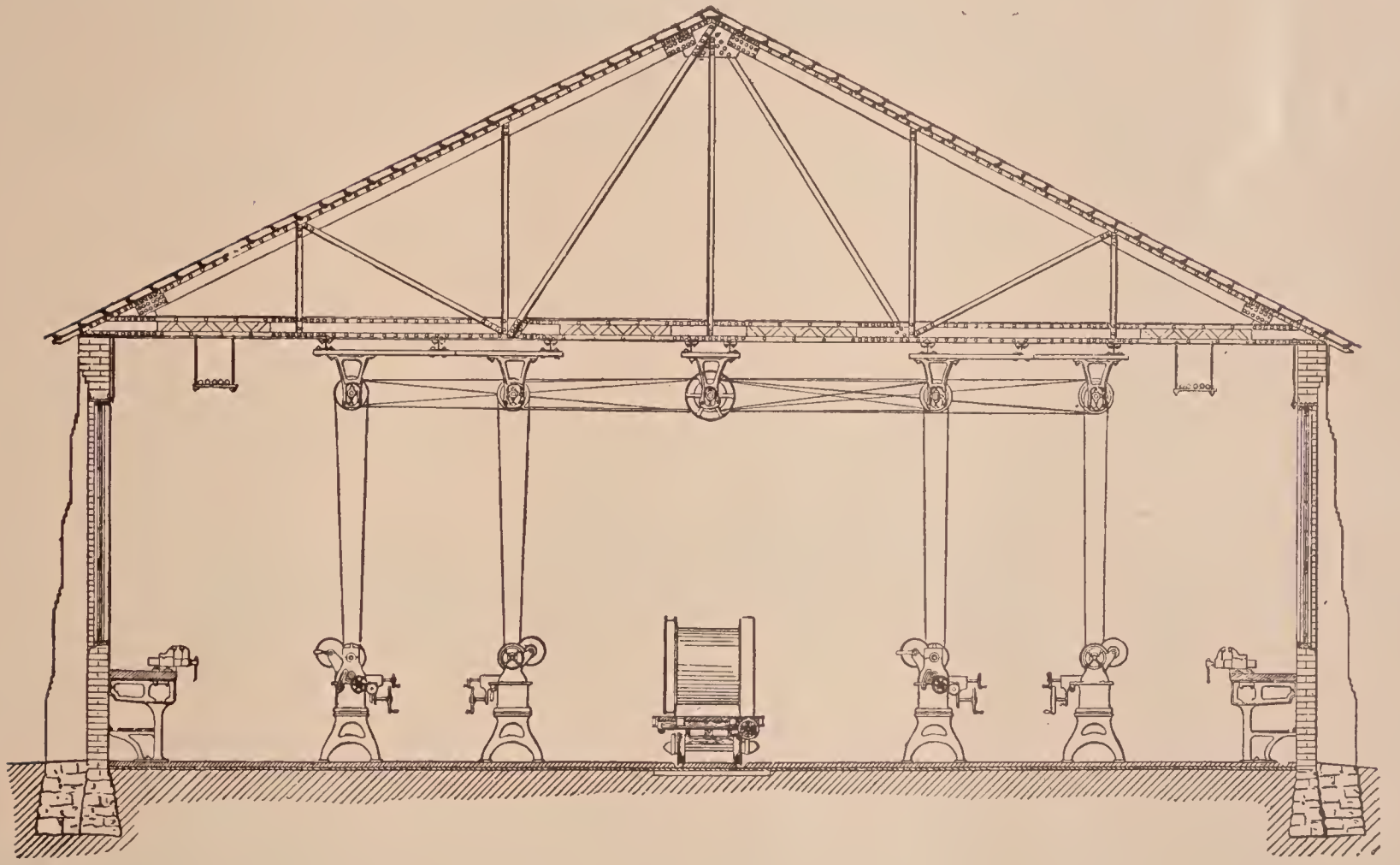
For particulars see our catalogue on "Industrial Railways."



No. 153.

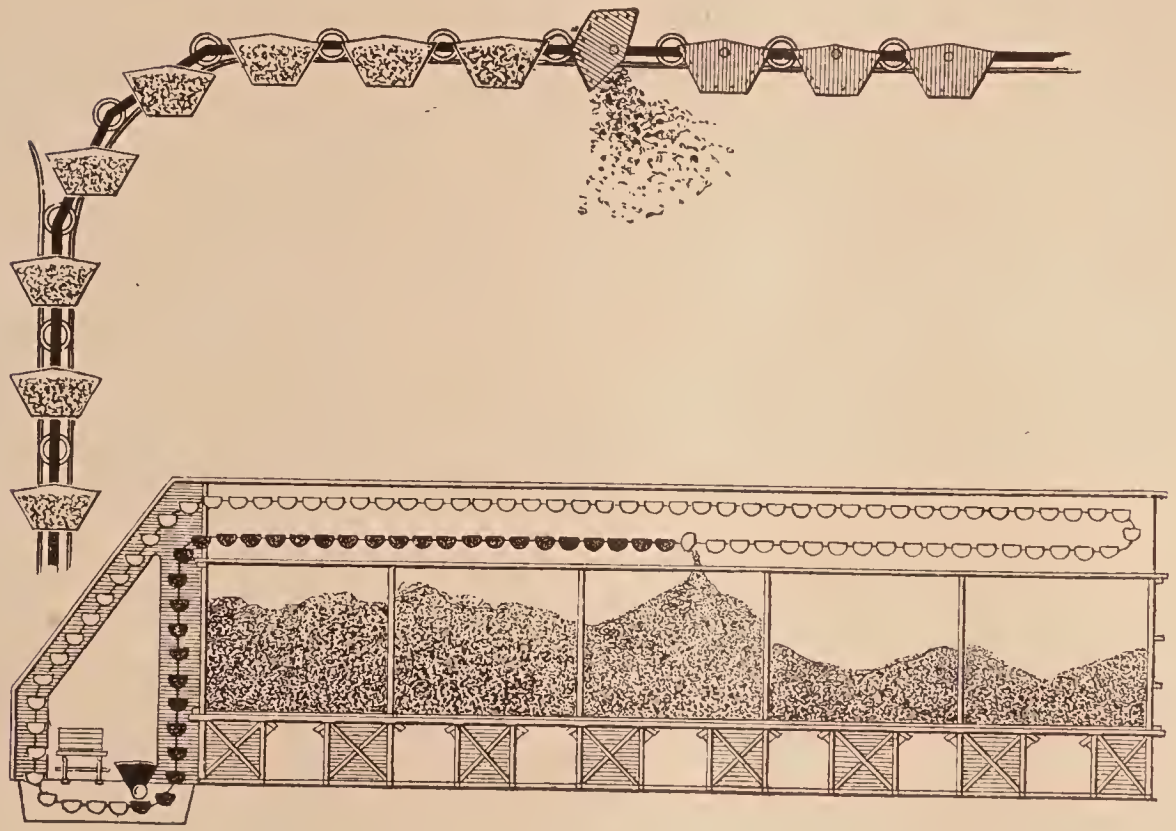
1, 2, 3, 4, 5, 6, 7, Level.								
8, 9, 10	1	in.	80	or 66	feet	per	mile.
11	1	"	48	" 110	"	"	"
12 13	1	"	37	" 142	"	"	"
14. 15	1	"	26	" 203	"	"	"
16	1	in.	22	or 240	feet	per	mile,
17	1	"	20	" 264	"	"	"
18, 19	1	"	15	" 352	"	"	"
20	1	"	13	" 406	"	"	"
21	1	"	12	" 440	"	"	"

The system of tracks at the works of the C. W. Hunt Company, at West New Brighton, Staten Island, N. Y., for handling all kinds of machinery and supplies. Curves in use are 12 feet radius.



No. 1155.

Cross section of the fire proof machine shop of the C. W. Hunt Company, West New Brighton, Staten Island, N Y.



No. 1126.

McCaslin Transfer.

This is a chain conveyor that carries the material from the loading point to the storage bins in a direction either vertical, inclined, or horizontal, without shock, breakage, or violence.

C. W. HUNT COMPANY, NEW YORK.

WE design and furnish of our own make all parts of machinery for unloading vessels, and storing cargoes of coal, ore, gypsum, and similar materials. We have been in this special line of business for more than fifteen years, and our coal handling machinery is in use in almost every port of America. We have ample shops and machinery, and manufacture everything we sell, except rails, rope and one class of engines. We also design and make plans for all classes of wharves, trestles and storage buildings for storing coal and ore, and similar materials.

Business men must elect what class of customers to deal with. We seek that class of purchasers who wish articles built thoroughly well, and which have every part carefully made from the best materials, and who are willing to pay whatever amount may be necessary to obtain such articles. For this reason we give no anxious thought as to whether this or that can be made a little cheaper, but have the materials and workmanship just as thoroughly good as possible the sole criterion being whether the article will be better adapted for its work, or more durable in use. We do not care to sell any machine that is not as good in every respect as though the purchaser himself had selected the materials, and personally supervised its construction in our factory.

It is a common idea that, because coal is heavy and dusty, coal machinery is rough and coarse. This is a wholly mistaken belief. No Waltham watch or Baldwin locomotive is more carefully designed, the details more thoroughly studied, or the materials more carefully selected and worked into shape, than are the working parts of the Shovel, Elevator and Automatic Railway. It may seem at first sight to be a useless refinement to work to templets, turning shafts to vary less than one-thousandth of an inch, making taper fits and other refinements of modern mechanism, on machinery to be roughly handled, covered with grease and dust, and exposed to every storm, but it is a positive economy. Durabil ty and freedom from delays justify this painstaking care and expense.

We make regularly and always have in stock coal elevators or hoists, automatic and cable railways, narrow gauge surface railways and their equipment, self-filling steam shovels for coal, self righting steel tubs for coal, stone or ore, bottom dumping locomotive coaling buckets, hoisting blocks for manilla rope, wire rope and chain, mast and gaff, fittings, wheelbarrows, coal screens, coal chutes counting registers, T-rail, spikes and fish joints, crucible steel wire rope, extra quality "Stevedore" manilla hoisting rope, crane chain, friction hoisting drums, and engines of various sizes especially adapted for rapid hoisting, locomotives, flat, box, coal, coke and charging cars, switches, and crossings and every part of a complete system of narrow gauge railways. Everything except locomotives, kept in stock. These are always in process of construction, and can be furnished in from ten to sixty days.

We will be glad to correspond with those who have use for this class of machinery. It is no trouble to reply to letters of inquiry.

Our customers are entirely those who use and wear out the articles they purchase; consequently, quality takes precedence of cost with them. Having no trade with middlemen, and paying no commissions, there is no temptation to reduce the quality of articles to compete with those who seek that class of business.

C. W. HUNT COMPANY, NEW YORK.

MODERN COAL HANDLING MACHINERY.

H. G. Jordon & Co., Coal Yard, Boston Mass Steam Shovels, Movable Elevators, Variable Automatic Hoisting Engines, Automatic Railways, Coal Pockets, and Screens.